HP ZBook x2 Detachable Workstation

Maintenance and Service Guide
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Product notice

Not all features are available in all editions of Windows 10. This tablet may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 10 functionality. See for http://www.microsoft.com details.

Safety warning notice

⚠ WARNING! To reduce the possibility of heat-related injuries or of overheating the device, do not place the device directly on your lap or obstruct the device air vents. Use the device only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to contact the skin or a soft surface, such as pillows or rugs or clothing, during operation. The device and the AC adapter comply with the user-accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950-1).

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1 Product description

Category	Description
Product Name	HP ZBook x2 Detachable Workstation
Processors	● Intel® Core™ i7-8650U 1.90-GHz (turbo up to 4.20-GHz) quad core processor (8.0-GB L3 cache, 15-W) ● Intel Core i7-8550U 1.80-GHz (turbo up to 4.00-GHz) quad core processor (8.0-GB L3 cache, 15-W) ● Intel Core i7-7600U 2.80-GHz (turbo up to 3.90-GHz) dual core processor (4.0-GB L3 cache, 15-W) ● Intel Core i5-8250U 1.60-GHz (turbo up to 3.40-GHz) quad core processor (6.0-GB L3 cache, 15-W) ● Intel Core i5-7500U 2.70-GHz (turbo up to 3.50-GHz) dual core processor (4.0-GB L3 cache, 15-W) Support for Intel Dynamic Platform and Thermal Framework (Intel DPTF) in HP BIOS
Chipset	Integrated soldered-on-circuit (SoC)
Graphics	**Discrete graphics:** NVIDIA® Quadro® M620 N17M-Q3 graphics subsystem with 2-GB GDDR5 (128Mb×32, quantity 4), 128-bit Support for the following: ● “No discrete graphics” opion (only on tablet models equipped with a graphics subsystem with UMA memory) ● DreamColor (not available on tablet models equipped with a graphics subsystem with UMA memory or in Hybrid graphics mode) ● Hybrid (switchable) Graphics (not available on tablet models in HP DreamColor mode) ● NVIDIA Optimus Technology ● Open GL ● DisplayPort 1.2 (supported through Thunderbolt 3) ● NVIDIA Mosaic Technology **Internal graphics:** Intel GT2 Integrated Graphics
Panel	14.0-in, ultra-high definition (UHD), light-emitting diode (LED) backlight, AntiGlare (3840×2160), UWVA DreamColor, 16:9 aspect ratio, leopard film panel, 10-point multitouch [8-bit + 2 dithering] TouchScreen, 300 nits, 95% NTSC; Support for ZBook x2 pen
Memory	Two on-board system memory slots, non-customer-accessible/non-upgradable DDR4-2133 SODIMMS Support for dual-channel memory Supports up to 32-GB of system memory Supports the following DDR4-2133 configurations: ● 32768-MB (16384-MB × 2) ● 16384-MB (8192-MB × 2) ● 8192-MB (4096-MB × 2)
Storage	Support for the following solid-state drives:

Category	Description
Storage *(continued)*	- 1-TB, 2280.M2, Peripheral Component Interconnect Express (PCIe-3×4), Non-Volatile Memory Express (NVMe), Double-Speed (DS) solid-state drive - 1-TB, 2280.M2, PCIe-3×4, SuperSpeed (SS), HP Z Turbo Drive solid-state drive with triple-level cell (TLC) - 512-GB, 2280.M2, PCIe-3×4, NVMe, HP Z Turbo Drive solid-state drive - 512-GB, 2280, PCIe-3×4, self-encrypted drive (SED), HP Z Turbo Drive solid-state drive with Opal2 and TLC - 512-GB, M2, SATA-3, Federal Information Processing Standards (FIPS) solid-state drive with TLC - 256-GB, 2280.M2, PCIe-3×4, NVMe, SS, HP Z Turbo Drive solid-state drive with TLC - 256-GB, PCIe, NVMe, HP Z Turbo Drive solid-state drive with multilevel cell (MLC) - 128-GB, M.2, SATA-3 solid-state drive
Audio and video	**Audio:** HP Bang & Olufsen Audio Support for Bang & Olufsen stereo speakers Support for Intel Smart Sound Technology Audio (only on tablet models equipped with the Windows 10 operating system) **Microphones:** Dual- and single-array (dual-array only on tablet models equipped with a front-facing webcam) **Video:** Front-facing 720P infrared webcam Rear-facing 8-MP, MIPI webcam
Wireless	Integrated wireless local area network (WLAN) options by way of wireless module incorporated onto system board Dual WLANs antenna built into tablet Support for the Intel 802.11 2×2ac + Bluetooth 4.2 combination adapter (VPro) WLAN module Support for the following: - Miracast - S3/S4 wake on WLAN - SAR Intel Wireless LAN setting in BIOS - HP Sure Connect **Near-field communication (NFC):** NXP NPC100 I2C NCI 10mm×25mm module and antenna integrated into keyboard
External media cards	Micro-Secure Digital (SD®) media reader slot
Ports	- AC power (multipin) - Audio-out (headphone)/audio-in (microphone) - Full-size SD card - HDMI v1.4 - Micro-USB (used only for keyboard charging) - POGO-pin keyboard - USB 3.0 charging (S3/S5) - USB Type-C Thunderbolt 3 (2)

Category	Description
Keyboard/pointing devices	Backlit Bluetooth capable Charged through the micro-USB port ClickPad requirements: ● Image sensor clickpad ● Glass with chemical-etched surface ● Gestures enabled by default (2-finger scrolling, 2-finger zoom/pinch) ● Taps enabled as default
Power requirements	Support for a 4-cell, 70-WHr, 4.55-AHr, Li-ion battery Support for a 65-W, USB Type-C, 3-pin, non-PFC, AC adapter Support for a 1.00-m power cord with a C5 connector in 6 countries/regions.
Security	Support for the following: ● Alcor Integrated Smart Card Reader (integrated into keyboard) ● BIOS preboot power on - BIOS option (password, fingerprint) ● Drive Encryption preboot option - (password, fingerprint, selected Smart cards) ● Fingerprint reader ● Security lock ● Smart card authentication (not supported after tablet detached from the keyboard) ● Trusted Platform Module (TPM) 2.0 (Infineon, integrated onto the system board)
Operating system	**Operating system version:** Windows 10 RS2 **Preinstalled:** ● Windows 10 Home 64-bit ● Windows 10 Home 64-bit Chinese market (only available with PRC country location) ● Windows 10 Home 64-bit Single Language ● Windows 10 Professional 64-bit ● FreeDOS 2.0 **Restore media (DRDVD/USBR):** ● Windows 10 DRDVE (available with any Windows 10 operating system) ● Windows 10 USBR (for service only) ● Windows 10 Professional 64-bit OSDVD (available with any Windows 10 operating system) **Certified:** Microsoft WHQL **Web-only support:** Windows 10 Enterprise 64-bit and Windows 10 Enterprise 64-bit LTSB 1507
Serviceability	**End user replaceable parts:** ● AC adapter ● Keyboard ● Kickstand

2 Getting to know your tablet

This chapter provides details about the tablet components, where they're located, and how they work.

Locating hardware

To find out what hardware is installed on the tablet:

▲ Type `device manager` in the taskbar search box, and then select the **Device Manager** app.

A list displays all the devices installed on the tablet.

For information about system hardware components and the system BIOS version number, press fn+esc (select products only).

Locating software

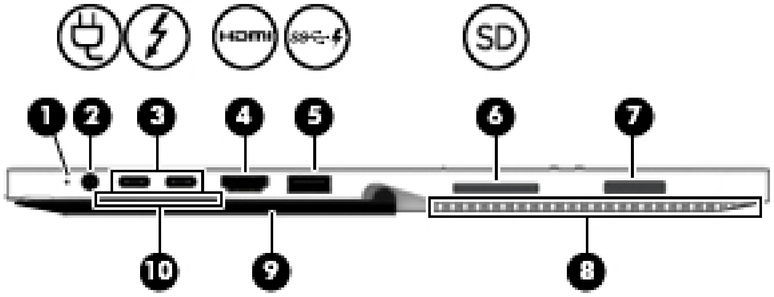
To find out what software is installed on the tablet:

▲ Select the **Start** button.

– or –

Right-click the **Start** button, and then select **Apps and Features**.

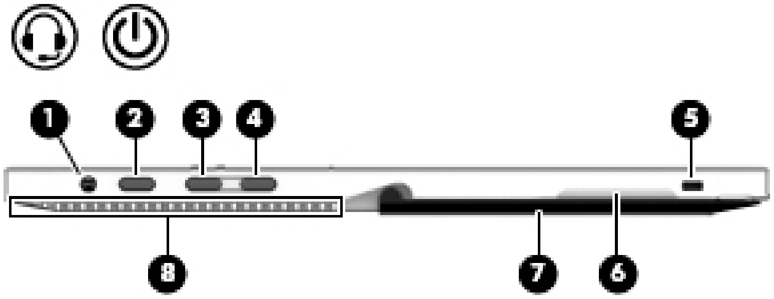
Right side



Item	Icon	Component	Description
(1)		Battery light	When AC power is connected: ● White: The battery charge is greater than 90 percent. ● Amber: The battery charge is from 0 to 90 percent. ● Off: The battery is not charging When AC power is disconnected (battery not charging): ● Blinking amber: The battery has reached a low battery level. When the battery has reached a critical battery level, the battery light begins blinking rapidly. ● Off: The battery is not charging
(2)	🔌	Power connector	Connects an AC adapter.
(3)	ϟ	USB Type-C power and Thunderbolt™ ports with HP Sleep and Charge (2)	Connect an AC adapter that has a USB Type-C connector, supplying power to the tablet and, if needed, charging the tablet battery. –and– Connect and charge most USB devices that have a Type-C connector, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer. NOTE: Cables and/or adapters (purchased separately) may be required. –and– Connect a display device that has a USB Type-C connector, providing DisplayPort output. NOTE: The tablet may also support a Thunderbolt docking station.
(4)	HDMI	HDMI port	Connects an optional video or audio device, such as a high-definition television, any compatible digital or audio component, or a high-speed High Definition Multimedia Interface (HDMI) device.
(5)	SS⭠ ϟ	USB 3.x SuperSpeed port with HP Sleep and Charge	Connects a USB device, provides high-speed data transfer, and even when the tablet is off, charges most products such as a cell phone, camera, activity tracker, or smartwatch.
(6)	SD	Memory card reader	Reads optional memory cards that store, manage, share, or access information. To insert a card:

Item	Icon	Component	Description
(6)	SD	Memory card reader *(continued)*	1. Hold the card label up, with the connectors facing the tablet. 2. Insert the card into the memory card reader, and then press in on the card until it is firmly seated. To remove a card: ▲ Press in on the card, and then remove it from the memory card reader.
(7)		Fingerprint reader (select products only)	Allows a fingerprint logon to Windows®, instead of a password logon.
(8)		Vents	Enable airflow to cool internal components. NOTE: The tablet fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(9)		Kickstand	Provides stability and a variety of viewing angles.
(10)		Kickstand access tab	Provides access to lift the kickstand away from the back of the tablet.

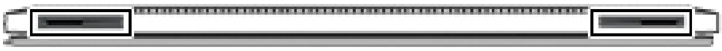
Left side



Item	Icon	Component	Description
(1)	🎧	Audio-out (headphone)/Audio-in (microphone) jack	Connects optional powered stereo speakers, headphones, earbuds, a headset, or a television audio cable. Also connects an optional headset microphone. This jack does not support optional standalone devices. WARNING! To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, refer to the *Regulatory, Safety, and Environmental Notices*. To access this guide: 1. Type `support` in the taskbar search box, and then select the **HP Support Assistant** app. –or– 2. Select **My PC**, select the **Specifications** tab, and then select **User Guides**. NOTE: When a device is connected to the jack, the tablet speakers are disabled.
(2)	⏻	Power button	● When the tablet is off, press the button to turn on the tablet. ● When the tablet is on, press the button briefly to initiate Sleep. ● When the tablet is in the Sleep state, press the button briefly to exit Sleep. ● When the tablet is in the Hibernation, press the button briefly to exit Hibernation. CAUTION: Pressing and holding down the power button results in the loss of unsaved information. If the tablet has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the tablet. To learn more about power settings, see power options: ▲ Right-click the **Power meter** icon and then select **Power Options**.
(3)		Volume up button	Increases speaker volume incrementally while you hold down the button.
(4)		Volume down button	Decreases speaker volume incrementally while you hold down the button.
(5)		Security cable slot	Attaches an optional security cable to the tablet.

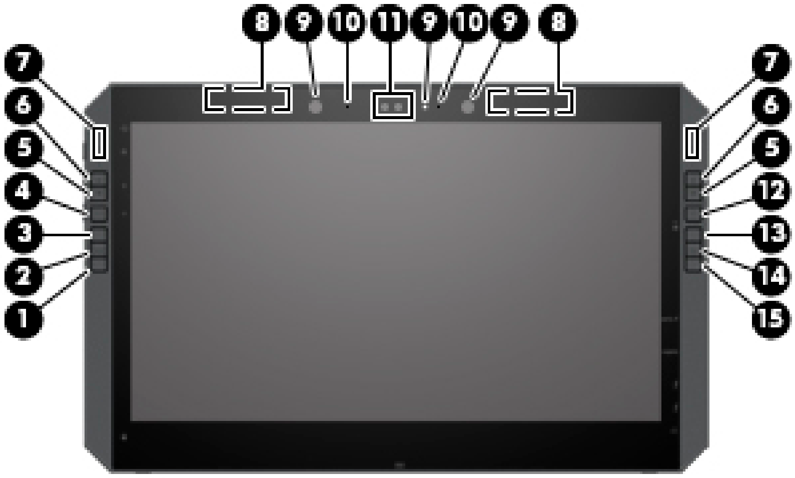
Item	Icon	Component	Description
(5)		Security cable slot *(continued)*	NOTE: The security cable is designed to act as a deterrent, but it may not prevent the tablet from being mishandled or stolen.
(6)		Kickstand access tab	Provides access to lift the kickstand away from the back of the tablet.
(7)		Kickstand	Provides stability and a variety of viewing angles.
(8)		Vents	Enable airflow to cool internal components. NOTE: The tablet fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.

Top



Component	Description
Speakers (2)	Produce sound.

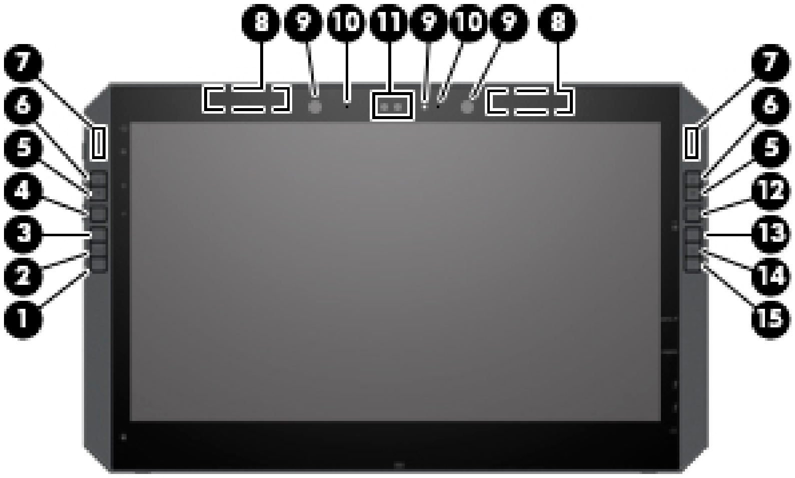
Front



NOTE: This tablet has HP Quick Keys. These keys provide quick access to app shortcuts, and they can be customized to perform the most common key commands with the push of a single button.

Item	Component	Description
(1)	HP Quick Key customizable button	Press the button to perform the customized action. The default action is Reference, which displays the interactive Virtual Desktop overlay for the customizable buttons and optional pen. The overlay displays what function each button is mapped to perform. For more information and to customize the button settings, see the User's Guide.
(2)	HP Quick Key customizable button	Press the button to perform the customized action. The default action is Undo. To customize the button settings, see the User's Guide.
(3)	HP Quick Key customizable button	Press the button to perform the customized action. The default action is Touch On/Off, which toggles the touch option on or off. To customize the button settings, see the User's Guide.
(4)	HP Quick Key customizable button	Press the button to cycle through the three customized options for the top two HP Quick Keys (the ones with the up and down arrows). The HP Quick Key Mode lights display which of the three Modes are active. The default setting controls only the left buttons. The left and right can be changed to mirror selections; see the User's Guide.
(5)	HP Quick Key customizable button	Press the button to perform the customized action. There are up to three actions, which depend on the Mode selected. Use the HP Quick Key Mode Select button to choose the mode. The HP Quick Key Mode lights show which Mode is active. The default actions are: ● Switch the Virtual Desktop left ● Snap the current window left ● Display File Explorer To customize the button settings, see the User's Guide.

Front *(continued)*



NOTE: This tablet has HP Quick Keys. These keys provide quick access to app shortcuts, and they can be customized to perform the most common key commands with the push of a single button.

Item	Component	Description
(6)	HP Quick Key customizable button	Press the button to perform the customized action. There are up to three actions, which depend on the Mode selected. Use the HP Quick Key Mode Select button to choose the mode. The HP Quick Key Mode lights show which Mode is active. The default actions are: ● Switch the Virtual Desktop right ● Snap the current window right ● Display Desktop To customize the button settings, see the User's Guide.
(7)	HP Quick Key Mode lights	On: The Mode is in use. In the default setting, the left Mode light displays when the HP Quick Key customizable buttons on the top left are used, and the right mode light displays when the HP Quick Key customizable buttons on the top right are used. The lights cycle to the next light each time the button is pressed, which corresponds to the function the HP Quick Key Mode button is set to perform.
(8)	WLAN antennas* (2)	Send and receive wireless signals to communicate with WLANs.
(9)	Camera lights (select products only)	On: One or more cameras are in use.
(10)	Internal microphones (2)	Record sound.

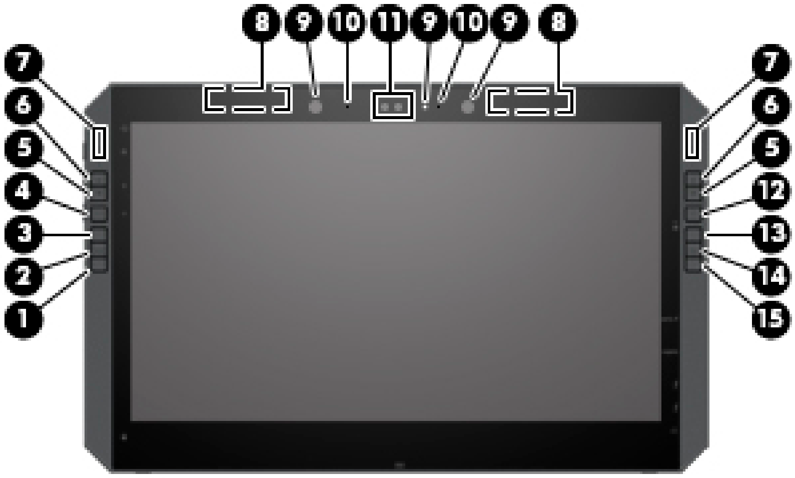
*The antennas are not visible from the outside of the tablet. For optimal transmission, keep the areas immediately around the antennas free from obstructions.

For wireless regulatory notices, see the section of the *Regulatory, Safety, and Environmental Notices* that applies to your country or region.

To access this guide:

▲ Select the **Start** button, select **All apps** (required on some products), select **HP Help and Support**, and then select **HP Documentation**.

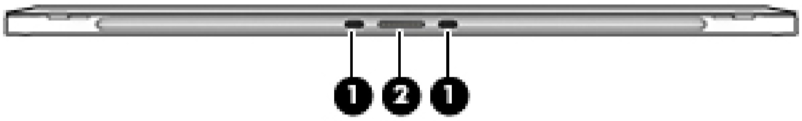
Front *(continued)*



NOTE: This tablet has HP Quick Keys. These keys provide quick access to app shortcuts, and they can be customized to perform the most common key commands with the push of a single button.

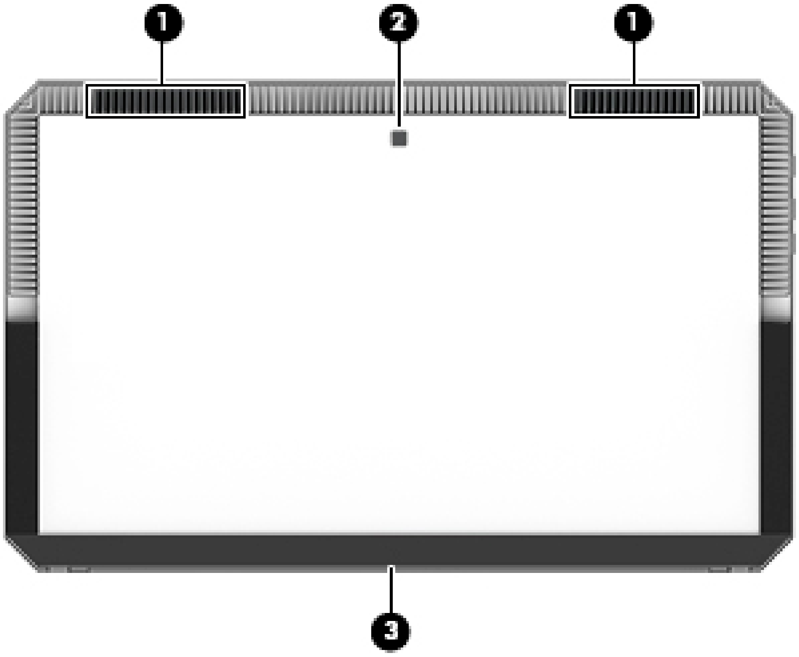
Item	Component	Description
(11)	Cameras (select products only)	Allow you to video chat, record video, and record still images. To use your camera, see the User's Guide. Some cameras also allow a facial recognition logon to Windows, instead of a password logon. For more information, see the User's Guide. NOTE: Camera functions vary depending on the camera hardware and software installed on your product.
(12)	HP Quick Key Mode Select button	Press the button to cycle through the three customized options for the top two HP Quick Keys (the ones with the up and down arrows) The HP Quick Key Mode lights display which of the three Modes are active. The default setting controls only the right buttons. The left and right can be changed to mirror selections; see the User's Guide.
(13)	HP Quick Key customizable button	Press the button to perform the customized action. The default action is Screen Rotation Lock, which toggles screen rotation on or off. To customize the button settings, see the User's Guide.
(14)	HP Quick Key customizable button	Press the button to perform the customized action. The default is Action Center, which displays the Windows Action Center. To customize the button settings, see the User's Guide.
(15)	HP Quick Key customizable button	Press the button to perform the customized action. The default action is Cortana® Voice, which starts the Windows personal assistant. To customize the button settings, see the User's Guide.

Bottom



Item	Component	Description
(1)	Alignment posts (2)	Connect to the alignment posts on the keyboard base.
(2)	Docking connector	Connects the tablet to the keyboard base.

Rear

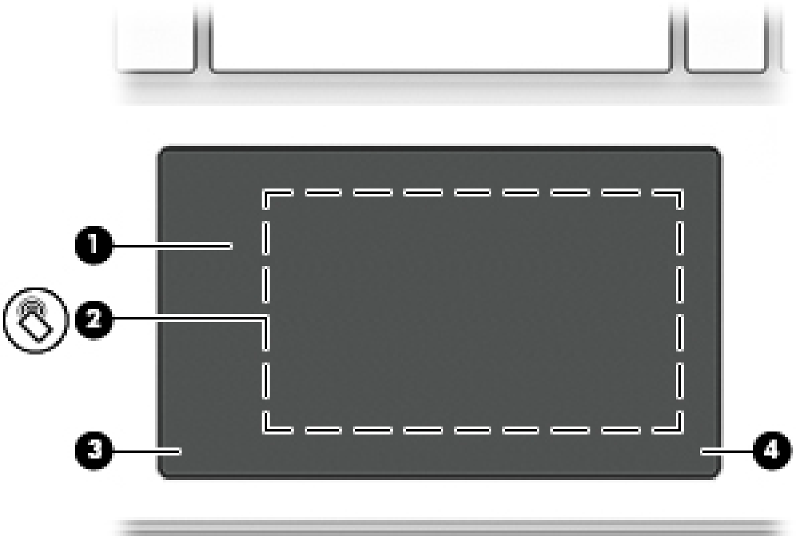


Item	Component	Description
(1)	Vents	Enable airflow to cool internal components. NOTE: The tablet fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(2)	Rear camera (select products only)	Allows you to video chat, record video, and record still images. To use your camera, see the User's Guide.
(3)	Kickstand	Provides stability and a variety of viewing angles.

Keyboard base components

The tablet supports a keyboard. This section provides information about the features of the keyboard.

TouchPad



Item	Component	Description
(1)	TouchPad zone	Reads finger gestures to move the pointer or activate items on the screen.
(2)	Near Field Communications (NFC) tapping area and antenna*	Allows you to wirelessly share information when you tap it with an NFC-enabled device.
(3)	Left TouchPad click area	Functions like the left button on an external mouse.
(4)	Right TouchPad click area	Functions like the right button on an external mouse.

*The antenna is not visible from the outside of the tablet. For optimal transmission, keep the area immediately around the antenna free from obstructions.

For wireless regulatory notices, see the section of the *Regulatory, Safety, and Environmental Notices* that applies to your country or region.

To access this guide:

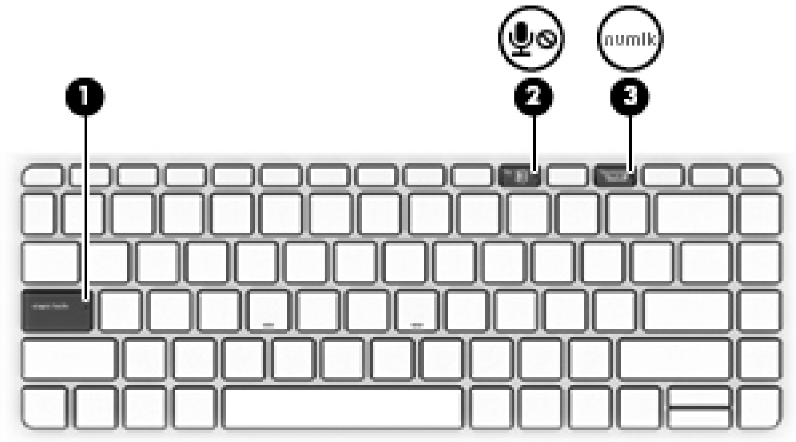
1. Type `support` in the taskbar search box, and then select the **HP Support Assistant app**.

   –or–

   Click the question mark icon in the taskbar.

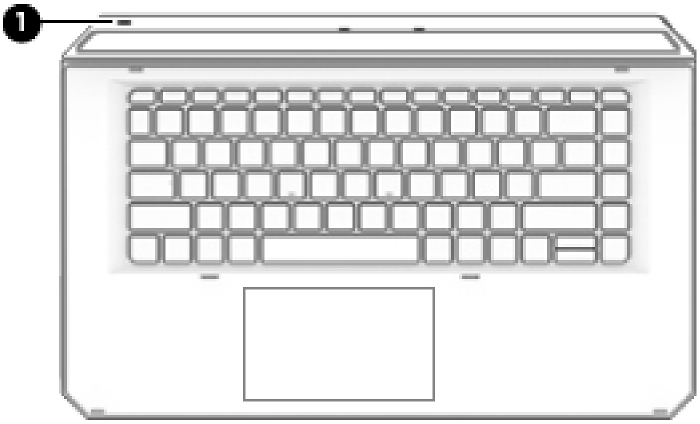
2. Select **My PC**, select the **Specifications** tab, and then select **User Guides**.

Lights



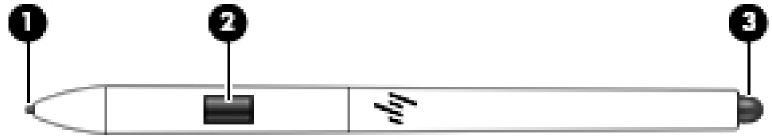
Item	Icon	Component	Description
(1)		Caps lock light	On: Caps lock is on, which switches the keys to all capital letters.
(2)	🎙	Microphone mute light	● Amber: Microphone sound is off. ● Off: Microphone sound is on.
(3)		Num lock light	On: Num lock is on.

USB port



Item	Component	Description
(1)	Micro USB port	Connects a micro USB cable (purchased separately), that can be used to supply power to the keyboard and, if needed, charge the keyboard battery. NOTE: The keyboard battery charges automatically when the keyboard is connected to the tablet using the docking connector.

Optional HP ZBook x2 Pen



Item	Component	Description
(1)	Tip/removable nib	Draws on the screen. Increased pressure applied to the tip results in wider or darker lines, depending on the software app. The nib is removable. NOTE: Felt and POM tips are included with the pen. To remove the nib from the pen, use the nib removal tool or pen case provided. NOTE: For optimum performance, always store the pen in the pen case. Do not store the pen in a cup or other container with the tip down, as this may cause issues with pen performance over time.
(2)	Button	Provides additional functions for the pen, depending on the software app. NOTE: To customize the button settings, see the User's Guide
(3)	Eraser	Removes what is drawn on the screen, depending on the software app. NOTE: To customize the button settings, see the User's Guide

3 Illustrated parts catalog

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your tablet, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

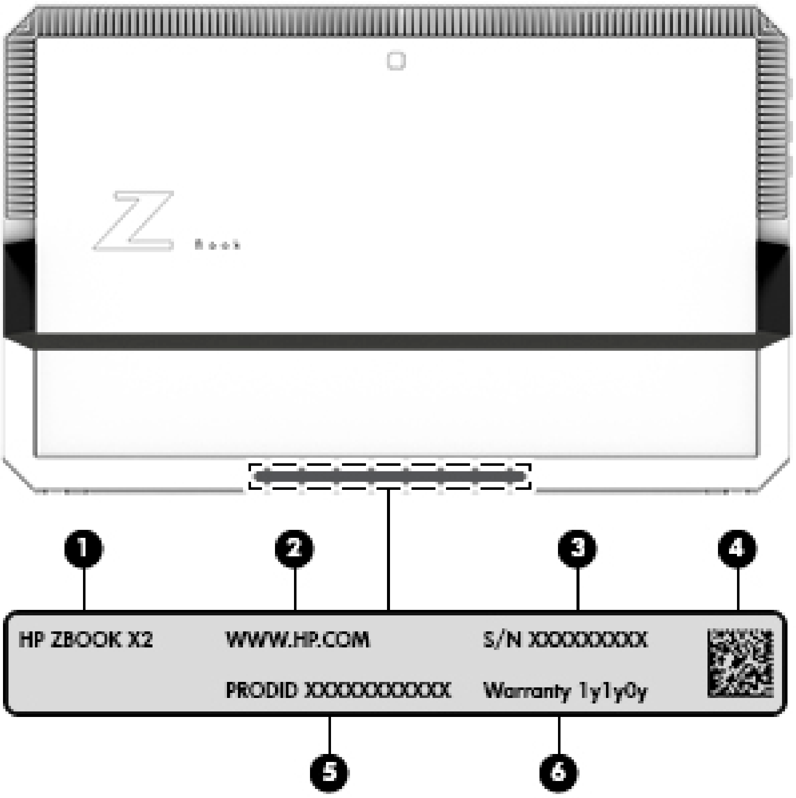
Labels

The labels on the tablet provide information that may be needed when troubleshooting system problems or travelling internationally with the tablet.

IMPORTANT: Check the following locations for the labels described in this section: the back of the display under the kickstand and the connection area of the keyboard.

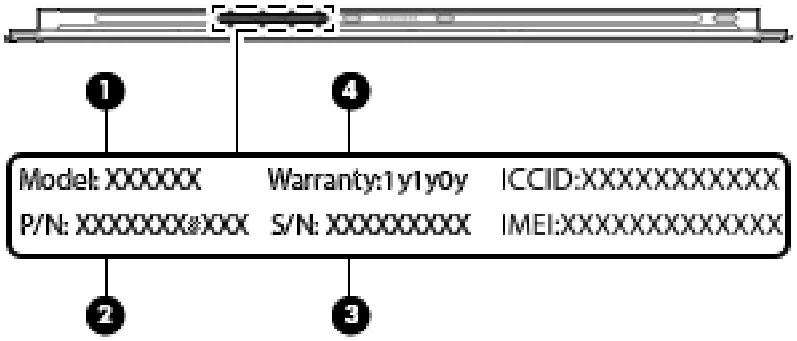
- Service label—Provides important information to identify the tablet and the keyboard. When contacting support, you will probably be asked for the serial number, and possibly for the product number or the model number. Locate these numbers before contacting support.

  The service label will resemble the examples shown below.



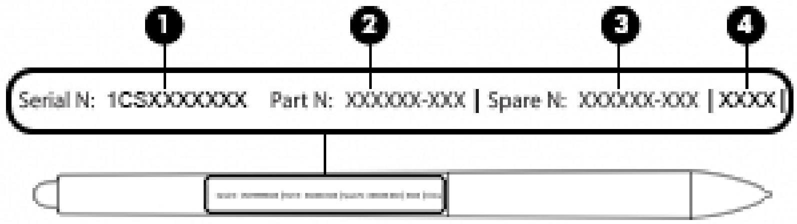
Component	Description
(1)	Model name (select products only)

Component	Description
(2)	Serial number
(3)	Product identification (The SKU# that is regionalized #ABA, #ABM)
(4)	Warranty period
(5)	2D bar code that has serial number and product identification information stored


1
4
Model: XXXXXX
Warranty:1y1y0y
ICCID:XXXXXXXXXXX
P/N: XXXXXXX#XXX
S/N: XXXXXXXXX
IMEI:XXXXXXXXXXXXXX
2
3

Component	Description
(1)	Model name (select products only)
(2)	Product number
(3)	Serial number
(4)	Warranty period

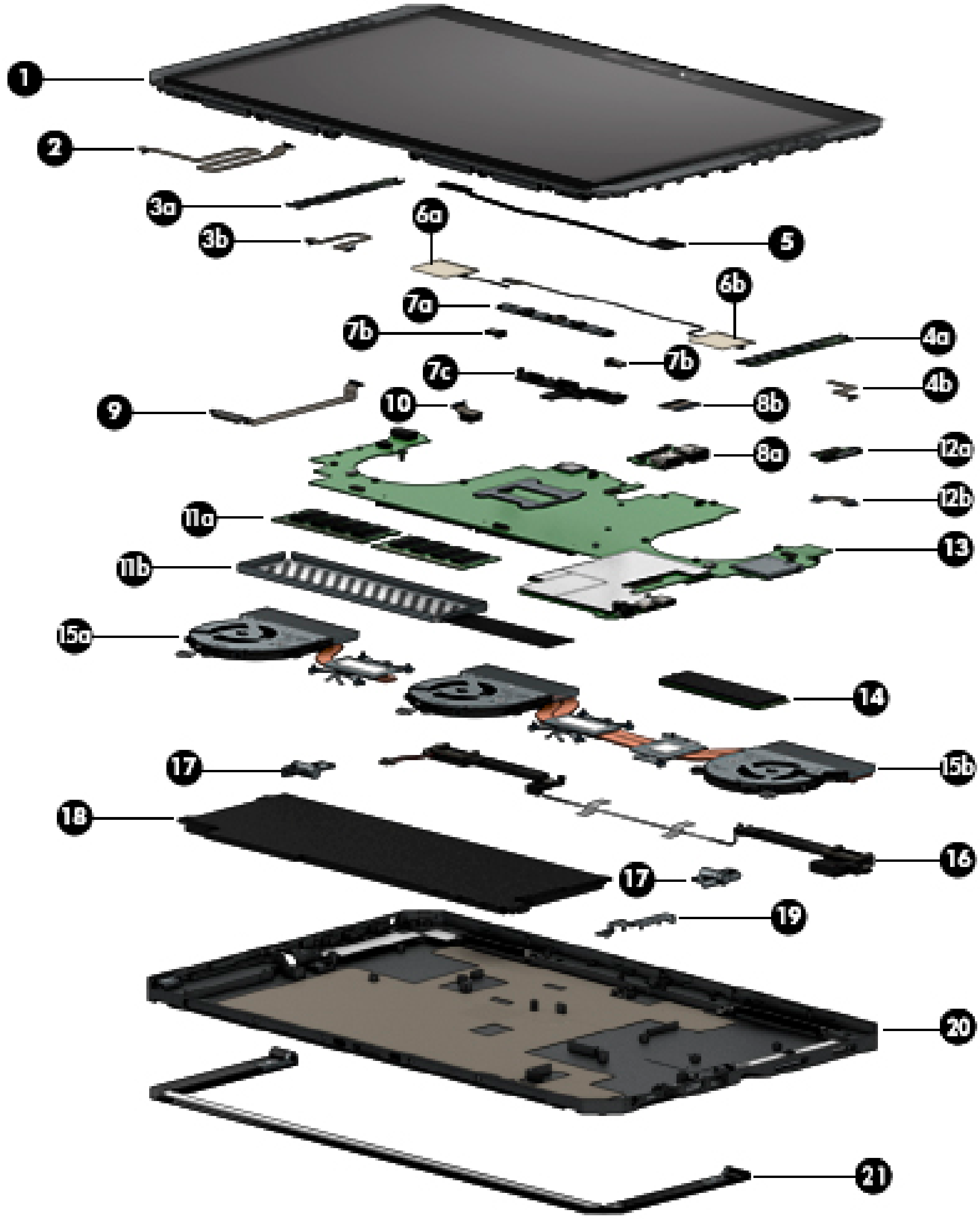
The labels on the pen provide information that may be needed when troubleshooting problems or replacing the pen.


1
2
3
4
Serial N: 1CSXXXXXXX
Part N: XXXXXX-XXX
Spare N: XXXXXX-XXX
XXXX

Component	Description
(1)	Serial number
(2)	Part number

Component	Description
(3)	Spare part number
(4)	Batch number

Tablet components


1
2
3a
3b
6a
5
6b
7a
7b
4a
7b
7c
4b
9
10
8b
8a
12a
12b
11a
13
11b
15a
14
17
15b
18
16
17
19
20
21

Item	Component	Spare part number
(1)	**Display panel assembly** (14.0-in, LED, AntiGlare (3840×2160), UWVA DreamColor, 16:9 aspect ratio, includes magnets, shielding, and TouchScreen control board and cable)	L03245-001
(2)	**TouchScreen control board cable** (included with the display panel assembly spare part kit)	
(3a) and (4a)	**QuickKey button boards** (2, left and right QuickKey button boards, include cables)	L03247-001
(5)	**Display panel cable** (includes extension cable, grounding tape, and double-sided adhesive)	L13280-001
(6a) and (6b)	**Wireless Antenna Kit** (includes main and auxiliary wireless antenna cables, transceivers, and double-sided adhesive)	L03255-001
(7a)	**Front-facing webcam/microphone module** (includes cables, bracket, and double-sided adhesive)	L03250-001
(7b)	**Front-facing webcam/microphone module cables** (2, included with front-facing webcam/microphone module)	
(7c)	**Camera bracket** (included with front-facing webcam/microphone module)	
	Microphone module (not illustrated, includes cable and rubber isolator)	L03252-001
(8a)	**HDMI/USB port connector board** (includes HDMI port, USB port, and cable)	L03248-001
(9)	**POGO pin connector cable** (includes POGO connector and double-sided adhesive)	L03262-001
(10)	**Rear-facing webcam module** (includes cable)	L03251-001
(11a)	**Memory module** (2400, 1.2-V DDR4):	
	16 GB	865396-855
	8 GB	862397-855
	4 GB	862398-855
(11b)	**Memory module shield** (includes solid-state drive shield; included in the Bracket Kit, spare part number L03254-001)	
(12a)	**Fingerprint reader module** (includes cable)	L03249-001
(13)	**System board** (includes processor and replacement thermal material):	
	Equipped with an Intel Core i7-8650U 1.90-GHz (turbo up to 4.20-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L13281-601
	Equipped with an Intel Core i7-8650U 1.90-GHz (turbo up to 4.20-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L13281-001
	Equipped with an Intel Core i7-8550U 1.80-GHz (turbo up to 4.00-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03241-601
	Equipped with an Intel Core i7-8550U 1.80-GHz (turbo up to 4.00-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L03241-001
	Equipped with an Intel Core i7-7600U 2.80-GHz (turbo up to 3.90-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03243-601
	Equipped with an Intel Core i7-7600U 2.80-GHz (turbo up to 3.90-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L03243-001

Item	Component	Spare part number
	Equipped with an Intel Core i5-8250U 1.60-GHz (turbo up to 3.40-GHz) quad core processor (6.0-GB L3 cache, 15-W), an Intel GT2 Integrated Graphics subsystem with UMA video memory, and the Windows 10 operating system	L03240-601
	Equipped with an Intel Core i5-8250U 1.60-GHz (turbo up to 3.40-GHz) quad core processor (6.0-GB L3 cache, 15-W), an Intel GT2 Integrated Graphics subsystem with UMA video memory, and a non-Windows 10 operating system	L03240-001
	Equipped with an Intel Core i7-7500U 2.70-GHz (turbo up to 3.50-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03242-601
	Equipped with an Intel Core i7-7500U 2.70-GHz (turbo up to 3.50-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L03242-001
(14)	**Solid-state drive:**	
	1-TB, 2280.M2, PCIe-3×4, NVMe, DS solid-state drive	L11069-001
	1-TB, 2280.M2, PCIe-3×4, SS, HP Z Turbo Drive solid-state drive with TLC	L12500-001
	512-GB, 2280.M2, PCIe-3×4, NVMe, HP Z Turbo Drive solid-state drive	L11071-001
	512-GB, 2280, PCIe-3×4, SED solid-state drive, HP Z Turbo Drive with Opal2 and TLC	L11072-001
	512-GB, M2, SATA-3, FIPS solid-state drive with TLC	L11067-001
	256-GB, 2280.M2, PCIe-3×4, NVMe, SS, HP Z Turbo Drive solid-state drive with TLC	L11070-001
	256-GB, PCIe, NVMe solid-state drive, HP Z Turbo Drive with MLC	L11073-001
	128-GB, M.2, SATA-3 solid-state drive	L11068-001
	Fan/heat sink assembly (includes replacement thermal material):	
(15a)	For use only on tablet models equipped with a graphics subsystem with UMA memory (includes fan cable)	L03257-001
(15b)	For use only on tablet models equipped with a graphics subsystem with discrete memory (includes two fan cables)	L03256-001
(16)	**Speakers** (2, includes left and right speakers and cables)	L03253-001
(17)	**Hinges** (2, available in the Kickstand Hinge Kit, includes left and right hinges)	L13279-001
(18)	**Battery** (4-cell, 70-WHr, 4.55-AHr, Li-ion; includes cable)	856843-855
(19)	**Support bracket** (included in the Bracket Kit, spare part number L03254-001)	
(20)	**Back cover:**	
	For use only on tablet models equipped with a graphics subsystem with discrete memory	L04632-001
	For use only on tablet models equipped with a graphics subsystem with UMA memory	L13278-001
(21)	**Kickstand**	L03259-001
	RTC battery (not illustrated)	L03258-001
	Plastics Kit (not illustrated; includes SD card slot blank)	L03263-001
	Smart Card reader slot blank (not illustrated; includes pen loop)	L03261-001

Miscellaneous parts

Component	Spare part number
AC adapter:	
90-W AC adapter (PFC, S-3P, 4.5-mm)	710413-001
65-W HP Smart Adapter (non-PFC, EM, 4.5-mm)	714657-001
65-W AC adapter (non-PFC, S-3P, 4.5-mm)	710412-001
HP USB Type-C–to-USB Type-A dongle	833960-001
Keyboard with backlight and TouchPad:	
For use in Belgium	L03264-A41
For use in Brazil	L03264-201
For use in Bulgaria	L03264-261
For use in Canada	L03264-DB1
For use in the Czech Republic and Slovakia	L03264-FL1
For use in Denmark	L03264-081
For use in France	L03264-051
For use in Germany	L03264-041
For use in Greece	L03264-151
For use in Hungary	L03264-211
For use in Iceland	L03264-DD1
For use in India	L03264-D61
For use in Israel	L03264-BB1
For use in Italy	L03264-061
For use in Japan	L03264-291
For use in Latin America	L03264-161
For use in the Netherlands	L03264-B31
For use in Northwest Africa	L03264-FP1
For use in Norway	L03264-091
For use in Portugal	L03264-131
For use in Romania	L03264-271
For use in Russia	L03264-251
For use in Saudi Arabia	L03264-171
For use in Slovenia	L03264-BA1
For use in South Korea	L03264-AD1
For use in Spain	L03264-071
For use in Sweden and Finland	L03264-b71

Component	Spare part number
For use in Switzerland	L03264-BG1
For use in Taiwan	L03264-AB1
For use in Thailand	L03264-281
For use in Turkey	L03264-141
For use in the United Kingdom	L03264-031
For use in the United States	L03264-001
Power cord (C5-connector, 1.00-m):	
For use in Argentina	401300-010
For use in Australia	213356-011
For use in Brazil	438722-007
For use in Denmark	213353-011
For use in Europe	213350-012
For use in India	404827-006
For use in Israel	398063-006
For use in Italy	213352-011
For use in Japan	349756-005
For use in North America	213349-013
For use in the People's Republic of China	386497-011
For use in South Africa	361240-005
For use in South Korea	267836-011
For use in Switzerland	213354-011
For use in the Taiwan	393313-006
For use in the Thailand	285096-010
For use in the United Kingdom and Singapore	213351-011
Screw Kit	L03246-001
Stylus (active pen)	L03260-001

4 Removal and replacement preliminary requirements

Tools required

You will need the following tools to complete the removal and replacement procedures:

- Case utility tool or other flat-bladed, plastic tool
- Flat-bladed screw driver
- Magnetic screw driver
- Phillips P0 screw driver
- Phillips P00 screw driver
- Torx4 screw driver

Service considerations

The following sections include some of the considerations that you must keep in mind during disassembly and assembly procedures.

NOTE: As you remove each subassembly from the tablet, place the subassembly (and all accompanying screws) away from the work area to prevent damage.

Plastic parts

CAUTION: Using excessive force during disassembly and reassembly can damage plastic parts. Use care when handling the plastic parts. Apply pressure only at the points designated in the maintenance instructions.

Cables and connectors

⚠ CAUTION: When servicing the tablet, be sure that cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the tablet.

Cables must be handled with extreme care to avoid damage. Apply only the tension required to unseat or seat the cables during removal and insertion. Handle cables by the connector whenever possible. In all cases, avoid bending, twisting, or tearing cables. Be sure that cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced. Handle flex cables with extreme care; these cables tear easily.

Drive handling

⚠ CAUTION: Drives are fragile components that must be handled with care. To prevent damage to the tablet, damage to a drive, or loss of information, observe these precautions:

Before removing or inserting a drive, shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.

Before handling a drive, be sure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

Before removing a diskette drive or optical drive, be sure that a diskette or disc is not in the drive and be sure that the optical drive tray is closed.

Handle drives on surfaces covered with at least one inch of shock-proof foam.

Avoid dropping drives from any height onto any surface.

After removing drive, place it in a static-proof bag.

Avoid exposing a drive to products that have magnetic fields, such as monitors or speakers.

Avoid exposing a drive to temperature extremes or liquids.

If a drive must be mailed, place the drive in a bubble pack mailer or other suitable form of protective packaging and label the package “FRAGILE.”

Grounding guidelines

Electrostatic discharge damage

Electronic components are sensitive to electrostatic discharge (ESD). Circuitry design and structure determine the degree of sensitivity. Networks built into many integrated circuits provide some protection, but in many cases, ESD contains enough power to alter device parameters or melt silicon junctions.

A discharge of static electricity from a finger or other conductor can destroy static-sensitive devices or microcircuitry. Even if the spark is neither felt nor heard, damage may have occurred.

An electronic device exposed to ESD may not be affected at all and can work perfectly throughout a normal cycle. Or the device may function normally for a while, then degrade in the internal layers, reducing its life expectancy.

⚠ **CAUTION:** To prevent damage to the tablet when you are removing or installing internal components, observe these precautions:

Keep components in their electrostatic-safe containers until you are ready to install them.

Before touching an electronic component, discharge static electricity by using the guidelines described in this section.

Avoid touching pins, leads, and circuitry. Handle electronic components as little as possible.

If you remove a component, place it in an electrostatic-safe container.

The following table shows how humidity affects the electrostatic voltage levels generated by different activities.

⚠ **CAUTION:** A product can be degraded by as little as 700 V.

Typical electrostatic voltage levels

	Relative humidity		
Event	10%	40%	55%
Walking across carpet	35,000 V	15,000 V	7,500 V
Walking across vinyl floor	12,000 V	5,000 V	3,000 V
Motions of bench worker	6,000 V	800 V	400 V
Removing DIPS from plastic tube	2,000 V	700 V	400 V
Removing DIPS from vinyl tray	11,500 V	4,000 V	2,000 V
Removing DIPS from Styrofoam	14,500 V	5,000 V	3,500 V
Removing bubble pack from PCB	26,500 V	20,000 V	7,000 V
Packing PCBs in foam-lined box	21,000 V	11,000 V	5,000 V

Packaging and transporting guidelines

Follow these grounding guidelines when packaging and transporting equipment:

- To avoid hand contact, transport products in static-safe tubes, bags, or boxes.
- Protect ESD-sensitive parts and assemblies with conductive or approved containers or packaging.
- Keep ESD-sensitive parts in their containers until the parts arrive at static-free workstations.
- Place items on a grounded surface before removing items from their containers.
- Always be properly grounded when touching a component or assembly.
- Store reusable ESD-sensitive parts from assemblies in protective packaging or nonconductive foam.
- Use transporters and conveyors made of antistatic belts and roller bushings. Be sure that mechanized equipment used for moving materials is wired to ground and that proper materials are selected to avoid static charging. When grounding is not possible, use an ionizer to dissipate electric charges.

Workstation guidelines

Follow these grounding workstation guidelines:

- Cover the workstation with approved static-shielding material.
- Use a wrist strap connected to a properly grounded work surface and use properly grounded tools and equipment.
- Use conductive field service tools, such as cutters, screw drivers, and vacuums.
- When fixtures must directly contact dissipative surfaces, use fixtures made only of static-safe materials.
- Keep the work area free of nonconductive materials, such as ordinary plastic assembly aids and Styrofoam.
- Handle ESD-sensitive components, parts, and assemblies by the case or PCM laminate. Handle these items only at static-free workstations.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting or removing connectors or test equipment.

Equipment guidelines

Grounding equipment must include either a wrist strap or a foot strap at a grounded workstation.

- When seated, wear a wrist strap connected to a grounded system. Wrist straps are flexible straps with a minimum of one megohm ±10% resistance in the ground cords. To provide proper ground, wear a strap snugly against the skin at all times. On grounded mats with banana-plug connectors, use alligator clips to connect a wrist strap.
- When standing, use foot straps and a grounded floor mat. Foot straps (heel, toe, or boot straps) can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use foot straps on both feet with a minimum of one megohm resistance between the operator and ground. To be effective, the conductive must be worn in contact with the skin.

The following grounding equipment is recommended to prevent electrostatic damage:

- Antistatic tape
- Antistatic smocks, aprons, and sleeve protectors
- Conductive bins and other assembly or soldering aids
- Nonconductive foam
- Conductive tabletop workstations with ground cords of one megohm resistance
- Static-dissipative tables or floor mats with hard ties to the ground
- Field service kits
- Static awareness labels
- Material-handling packages
- Nonconductive plastic bags, tubes, or boxes
- Metal tote boxes
- Electrostatic voltage levels and protective materials

The following table lists the shielding protection provided by antistatic bags and floor mats.

Material	Use	Voltage protection level
Antistatic plastics	Bags	1,500 V
Carbon-loaded plastic	Floor mats	7,500 V
Metallized laminate	Floor mats	5,000 V

5 Removal and replacement procedures

This chapter provides removal and replacement procedures for Authorized Service Provider only parts.

⚠ CAUTION: Components described in this chapter should only be accessed by an authorized service provider. Accessing these parts can damage the tablet or void the warranty.

CAUTION: This tablet does not have user-replaceable parts. Only HP authorized service providers should perform the removal and replacement procedures described here. Accessing the internal part could damage the tablet or void the warranty.

Component replacement procedures

NOTE: Details about your tablet, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of the tablet. See Labels on page 17 for details.

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your tablet, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

There are as many as 49 screws that must be removed, replaced, and/or loosened when servicing Authorized Service Provider only parts. Make special note of each screw size and location during removal and replacement.

Kickstand

Description	Spare part number
Kickstand	L03259-001

Before removing the kickstand, follow these steps:

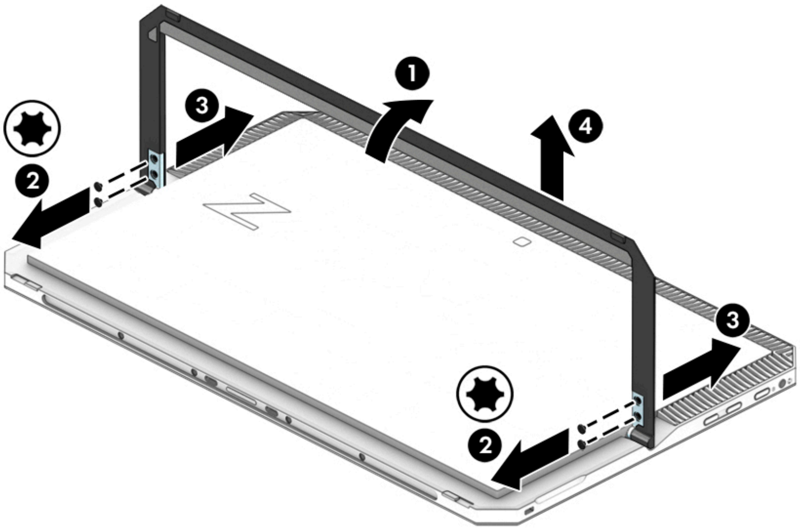
1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.

Remove the kickstand:

⚠ CAUTION: Before turning the tablet upside down, make sure the work surface is clear of tools, screws, and any other foreign objects. Failure to follow this caution can result in damage to the display panel.

1. Position the tablet with the display panel side down and the bottom edge toward you.
2. Swing the kickstand **(1)** into the released position.
3. Remove the four Torx4 M2.0×2.5 screws **(2)** that secure the kickstand to the hinges.
4. Slide the kickstand **(3)** back to release it from the hinges.

5. Remove the kickstand **(4)**.



Reverse this procedure to install the kickstand.

Display panel assembly

Description	Spare part number
Display panel assembly (14.0-in, LED, AntiGlare (3840×2160), UWVA DreamColor, 16:9 aspect ratio, includes display panel cable, magnets, shielding, and TouchScreen control board and cable)	L03245-001
Back cover:	
For use only on tablet models equipped with a graphics subsystem with discrete memory	L04632-001
For use only on tablet models equipped with a graphics subsystem with UMA memory	L13278-001

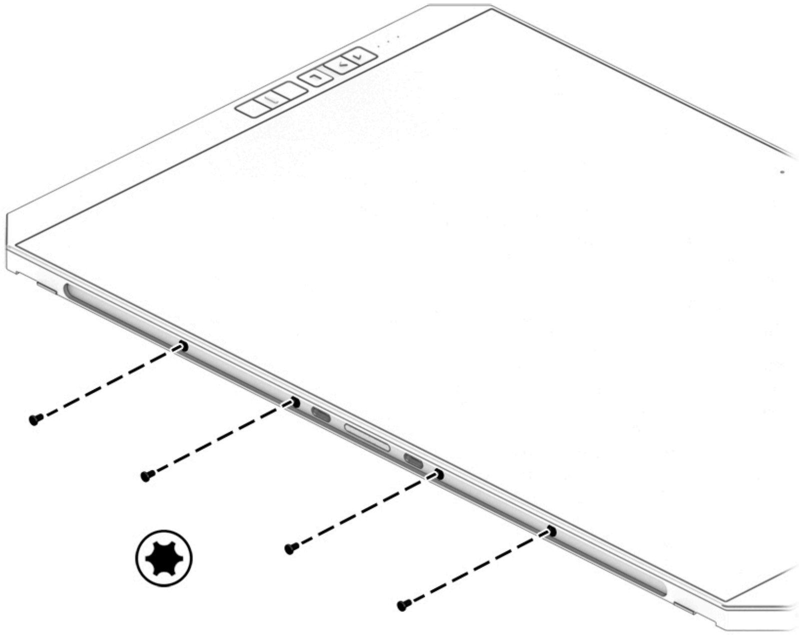
Before removing the display assembly, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.

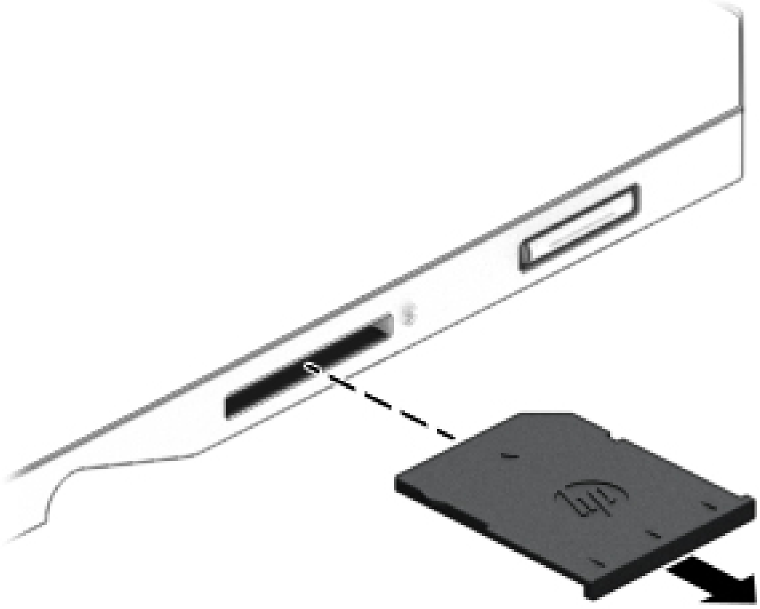
Remove the display panel assembly:

1. Position the tablet with the back cover facing down and the bottom edge toward you.

2. Remove the four Torx4 M2.0×4.2 shoulder screws that secure the display panel assembly to the tablet.



3. Remove the SD card slot blank.

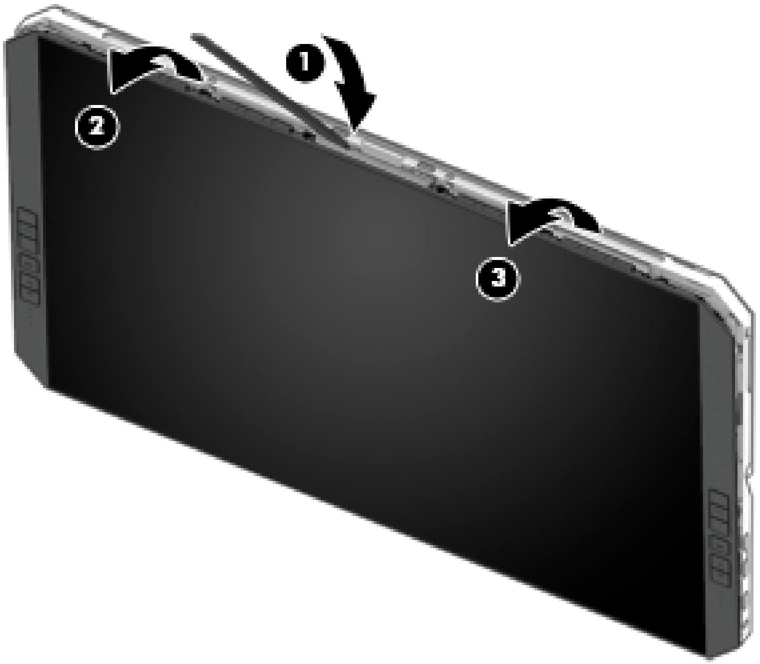


4. Rest and support the tablet on its top edge with the display panel toward you.

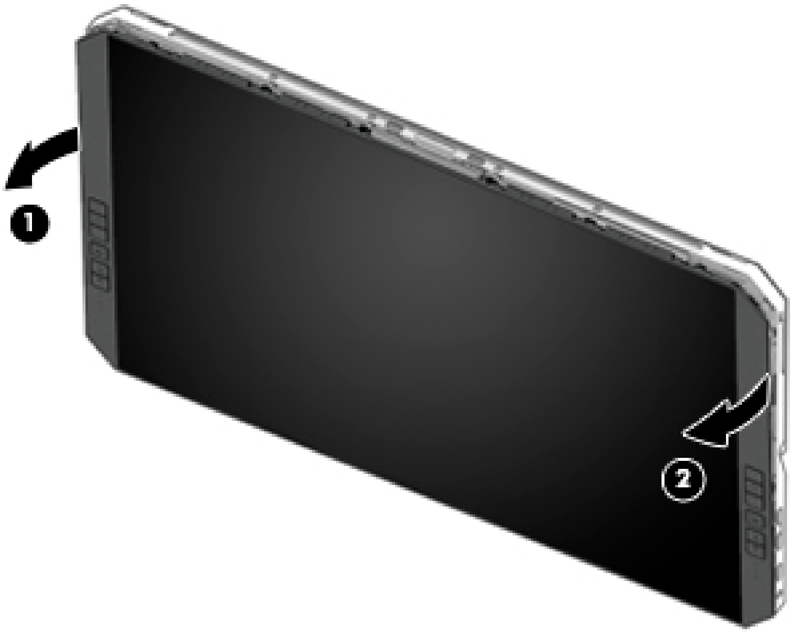
> ⚠ CAUTION: Use caution when separating the display panel assembly from the back cover. The internal component cables are fragile and only allow for a limited range of motion. Failure to follow this caution can result in damage to the internal components, their cables, and the system board.

5. Use your fingers or a case utility tool **(1)** or other similar thin plastic tool to separate the bottom edge of the display panel assembly from the back cover.

6. Separate the left side **(2)** of the bottom edge of the display panel assembly from the back cover.
7. Separate the right side **(3)** of the bottom edge of the display panel assembly from the back cover.

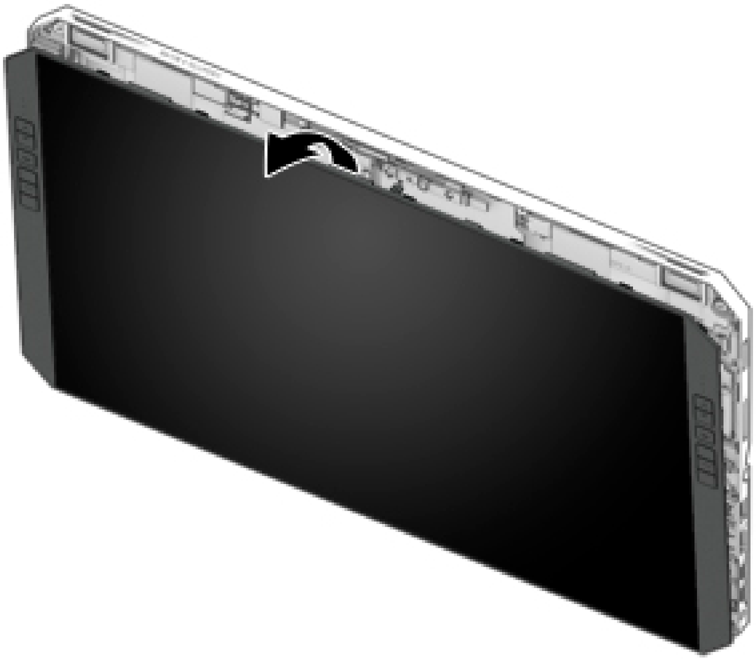


8. Separate the left **(1)** and right edges **(2)** of the display panel assembly from the back cover.



9. Rest and support the tablet on its bottom edge.

10. Separate the top edge of the display panel assembly from the back cover.

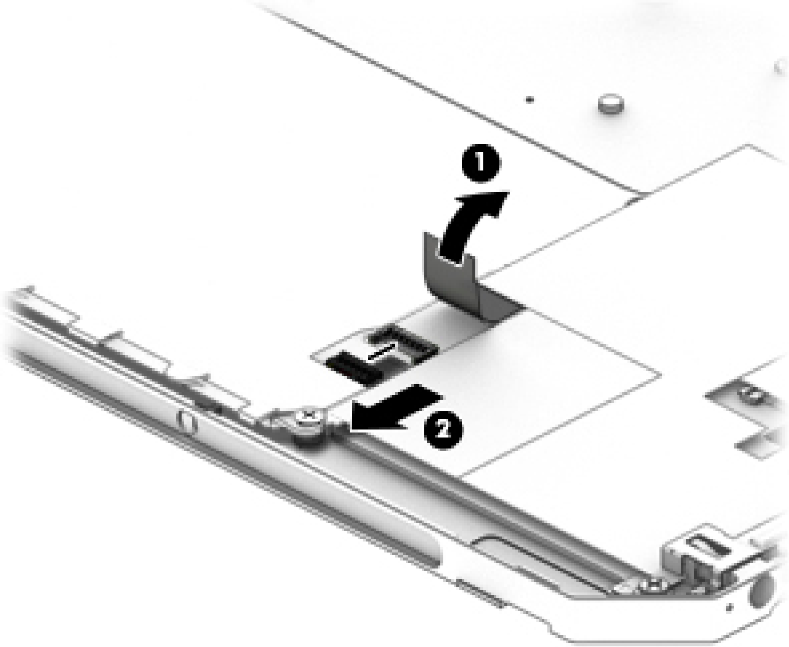


11. Position the tablet on its back cover with the bottom edge toward you.

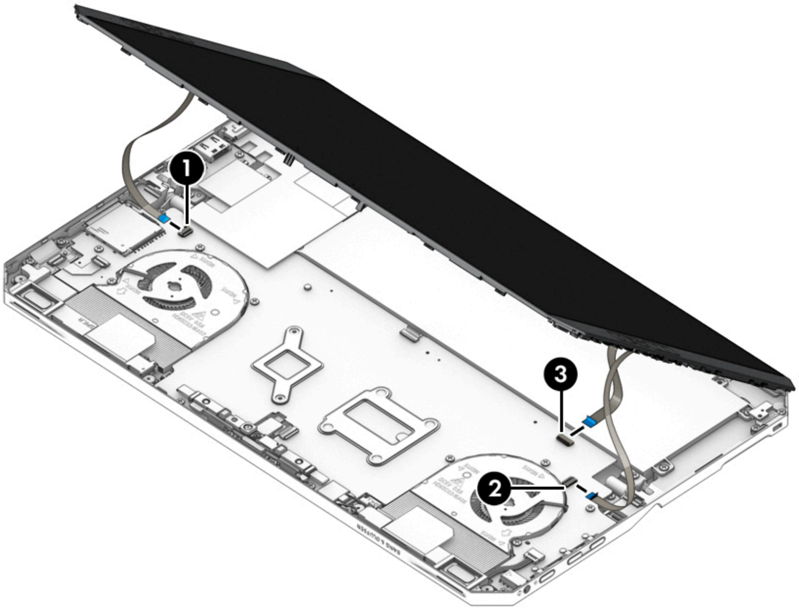
12. Release the retention tape **(1)** that secures the battery cable to the system board.

⚠ CAUTION: When disconnecting the battery cable, use the battery cable connector. Do not use the battery cable. Failure to follow this caution can result in damage to the battery cable.

13. Disconnect the battery cable **(2)** from the system board.



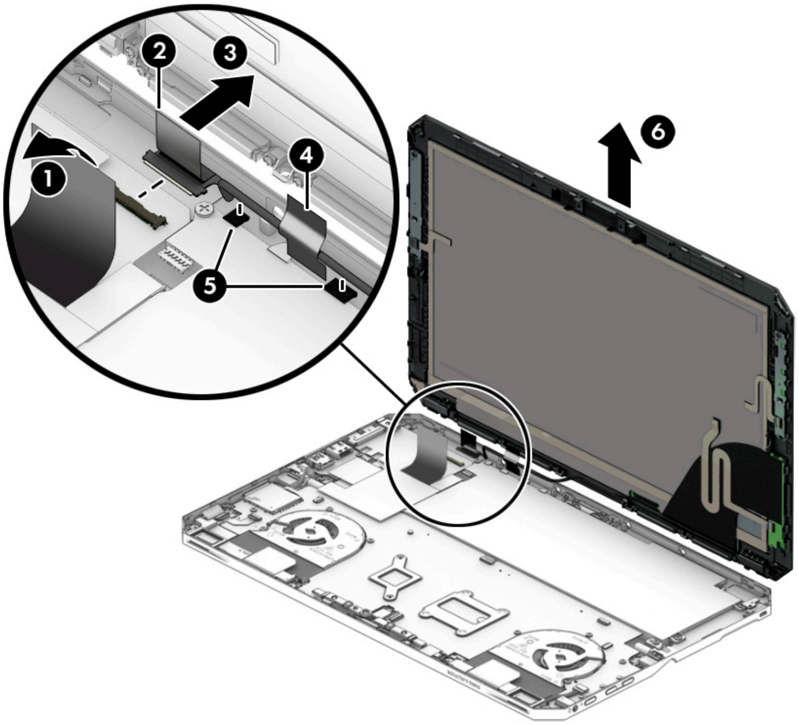
14. Position the tablet with the top edge toward you.
15. Release the zero insertion force (ZIF) connector **(1)** to which the right QuickKey button board cable is connected, and then disconnect the right QuickKey button board cable from the system board.
16. Release the ZIF connector **(2)** to which the left QuickKey button board cable is connected, and then disconnect the left QuickKey button board cable from the system board.
17. Release the ZIF connector **(3)** to which the TouchScreen control board cable is connected, and then disconnect the TouchScreen control board cable from the system board.



⚠ CAUTION: Before turning the display panel assembly upside down, make sure the work surface is clear of tools, screws, and any other foreign objects. Failure to follow this caution can result in damage to the display panel.

18. Swing the top edge of the display panel assembly up and forward until the display panel assembly rests upside down in front of the back cover.
19. Release the shielding material **(1)** that covers the display panel cable connector on the system board.
20. Release the adhesive support strip **(2)** that secures the display panel cable connector to the system board.
21. Use the release bar **(3)** to disconnect the display panel cable from the system board.
22. Release the retention tape **(4)** that secures the display panel cable to the system board.
23. Release the display panel cable from the retention clips **(5)** built into the display panel.

24. Remove the display panel assembly **(6)**.



Reverse this procedure to install the display panel assembly.

QuickKey button board

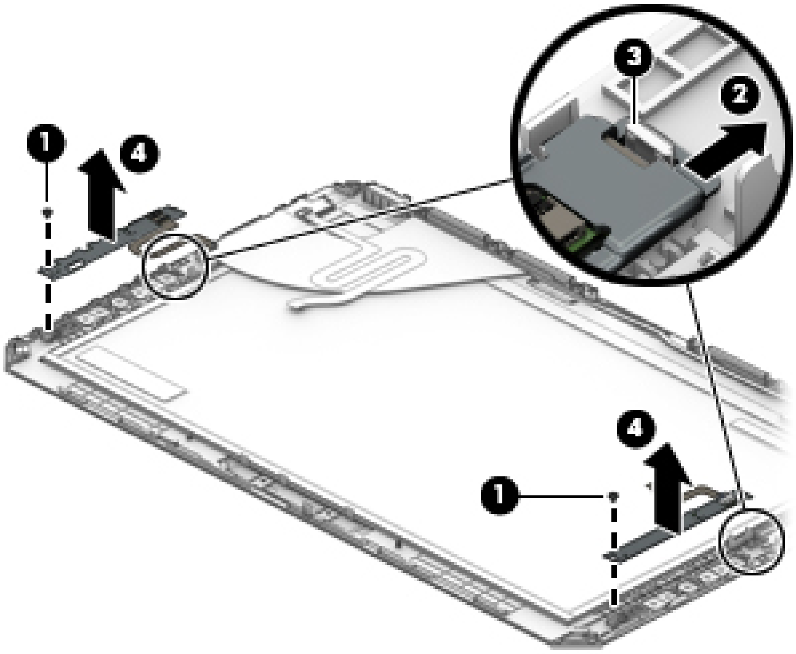
Description	Spare part number
QuickKey button boards (2, includes left and right button boards and cables)	L03247-001

Before removing the QuickKey button boards, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the QuickKey button boards:

1. Remove the two Phillips M2.0×3.0 screws **(1)** that secure the QuickKey button boards to the display panel assembly.
2. Release the QuickKey button boards **(2)** by sliding them toward the top edge of the tablet until the board disengages from the retention clip **(3)** built into the display panel assembly.
3. Remove the QuickKey button boards **(4)**.



Reverse this procedure to install the QuickKey button boards.

Display panel cable

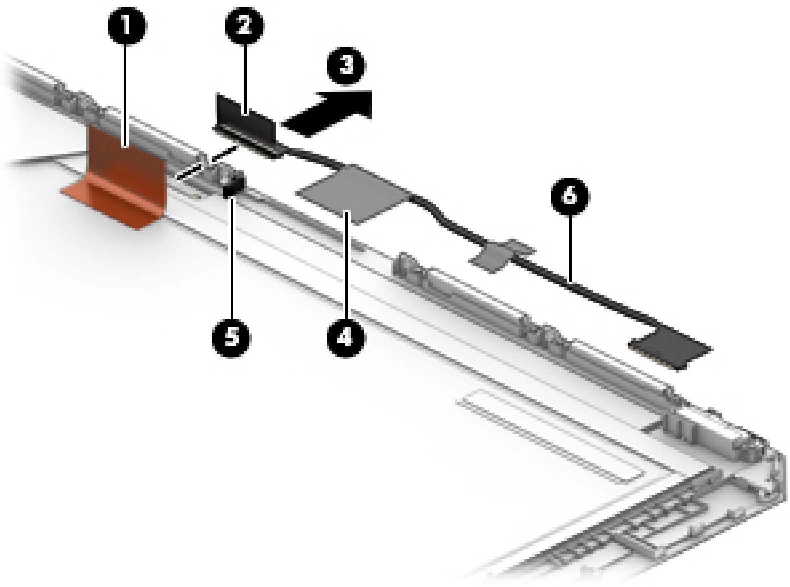
Description	Spare part number
Display panel cable (includes extension cable, grounding tape, and double-sided adhesive)	L13280-001

Before removing the display panel cable, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the display panel cable:

1. Release the shielding material **(1)** that covers the display panel cable connector on the display panel assembly.
2. Release the adhesive support strip **(2)** that secures the display panel cable connector to the display panel assembly.
3. Use the release bar **(3)** to disconnect the display panel cable from the display panel assembly.
4. Release the grounding tape **(4)** that secures the display panel cable to the display panel assembly.
5. Release the display panel cable from the retention clip **(5)** that secures the display panel cable to the display panel assembly.
6. Disconnect the DreamColor cable **(6)** from the display panel assembly (select models only).



7. Remove the display panel cable.

Reverse this procedure to install the display panel cable.

Fingerprint reader board

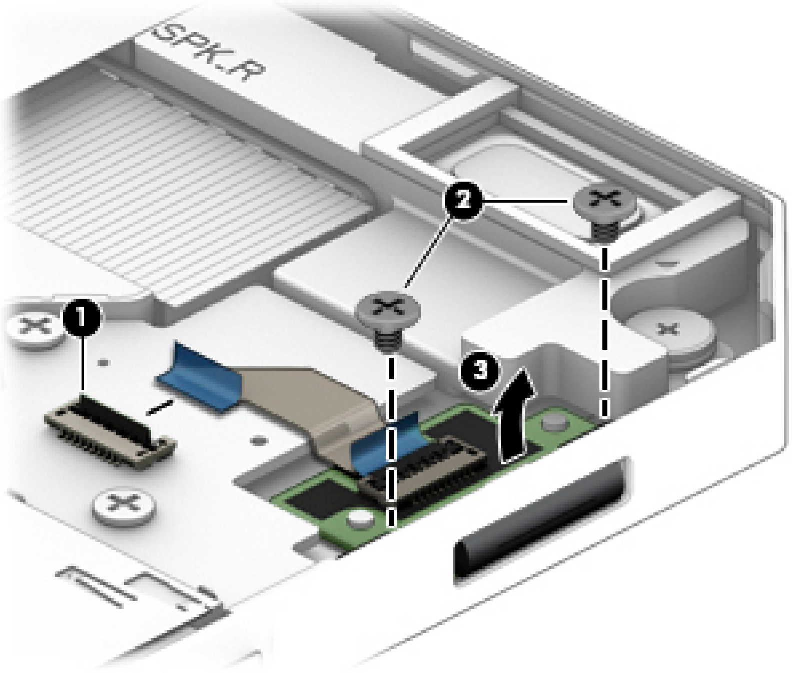
Description	Spare part number
Fingerprint reader board (includes cable)	L03249-001

Before removing the fingerprint reader board, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the fingerprint reader board:

1. Release the ZIF connector **(1)** to which the fingerprint reader board cable is connected, and then disconnect the fingerprint reader board cable from the system board.
2. Remove the two Phillips M2.0×3.0 screws **(2)** that secure the fingerprint reader board to the back cover.
3. Remove the fingerprint reader board **(3)**.



Reverse this procedure to install the fingerprint reader board.

Battery

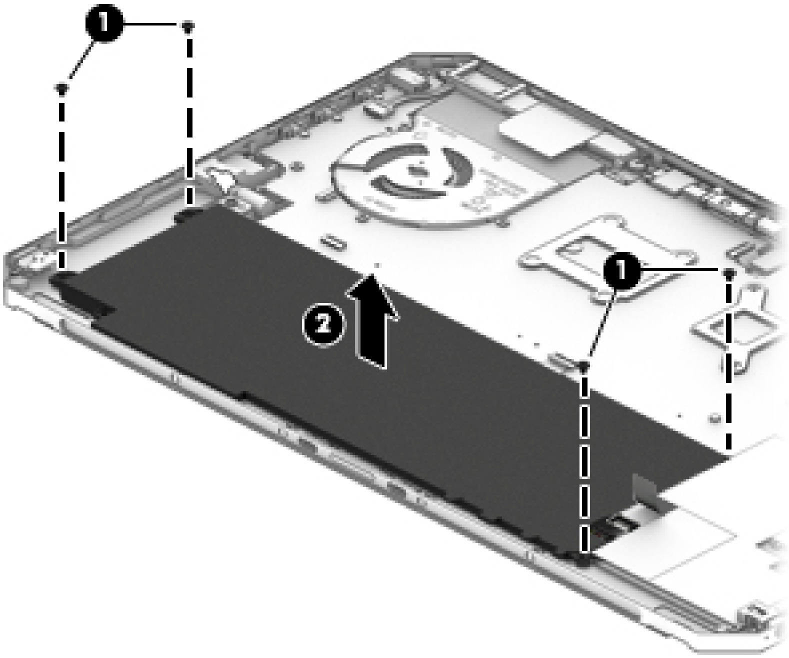
Description	Spare part number
4-cell, 70-WHr, 4.55-AHr, Li-ion battery (includes cable)	856843-855

Before removing the battery, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the battery:

1. Position the tablet back cover with the bottom edge toward you.
2. Remove the four Phillips M2.0×3.0 screws **(1)** that secure the battery to the back cover.
3. Remove the battery **(2)**.



Reverse this procedure to install the battery.

Wireless antenna

Description	Spare part number
Wireless antenna (includes main and auxiliary wireless antenna cables, transceivers, and double-sided adhesive)	L03255-001

Before removing the wireless antenna, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

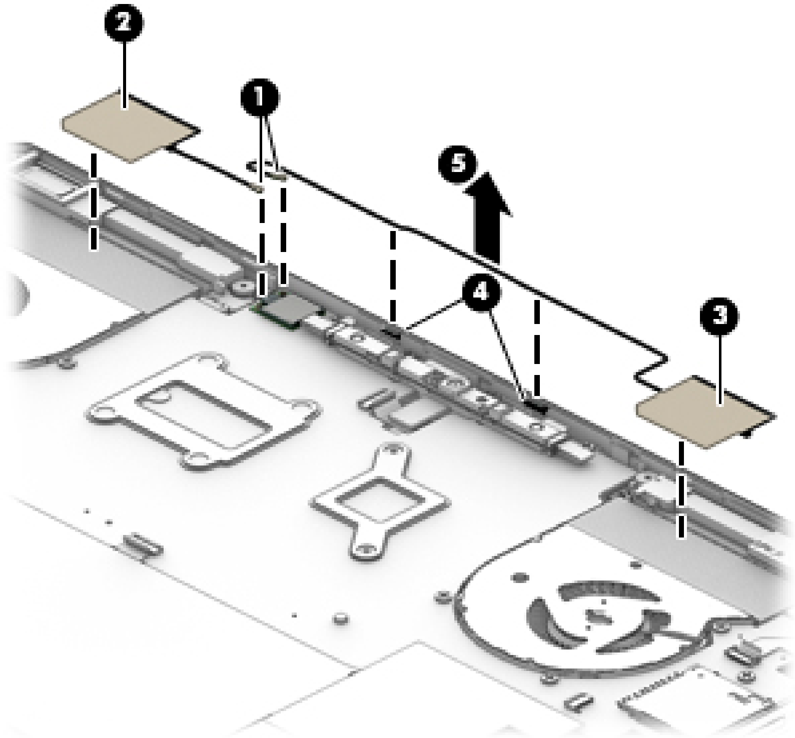
Remove the wireless antenna:

1. Disconnect the wireless antenna cables from the WLAN terminals on the system board.

   NOTE: The #1 WLAN antenna cable connects to the WLAN module "#1/Main" terminal. The #2 WLAN antenna cable connects to the WLAN module "#2/Aux" terminal.

2. Detach the wireless antenna auxiliary transceiver **(2)** from the back cover. (The wireless antenna auxiliary transceiver is attached to the back cover with double-sided adhesive.)
3. Detach the wireless antenna main transceiver **(3)** from the back cover. (The wireless antenna main transceiver is attached to the back cover with double-sided adhesive.)
4. Release the wireless antenna main cable from the retention clips **(4)** built into the back cover.

5. Remove the wireless antenna cables **(5)** and transceivers.



Reverse this procedure to install the wireless antenna.

Front-facing webcam/microphone module

Description	Spare part number
Front-facing webcam/microphone module (includes camera bracket, cables, and double-sided adhesive)	L03250-001
Microphone module (includes cable and double-sided adhesive)	L03252-001

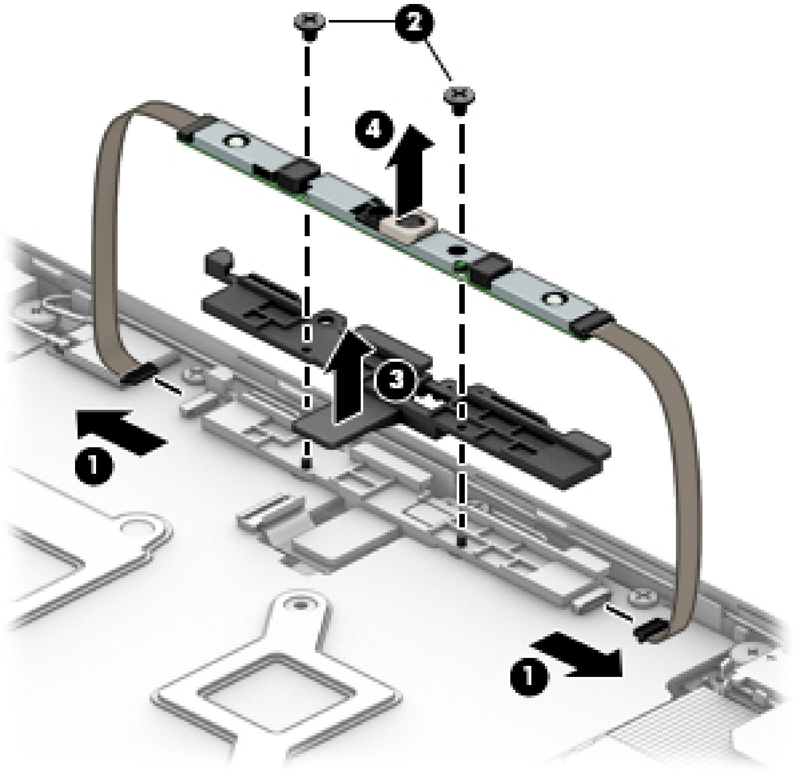
Before removing the front-facing webcam/microphone module, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the front-facing webcam/microphone module:

1. Disconnect the front-facing webcam/microphone module cables **(1)** from the system board.
2. Remove the two Phillips M2.0×3.0 screws **(2)** that secure the camera bracket to the back cover.
3. Remove the camera bracket and front-facing webcam/microphone module **(3)**.

   The camera bracket is included in the front-facing webcam/microphone module spare part kit.
4. Detach the front-facing webcam/microphone module **(4)** from the camera bracket. (The front-facing webcam/microphone module is attached to the camera bracket with double-sided adhesive.)



Reverse this procedure to install the front-facing webcam/microphone module.

Rear-facing webcam module

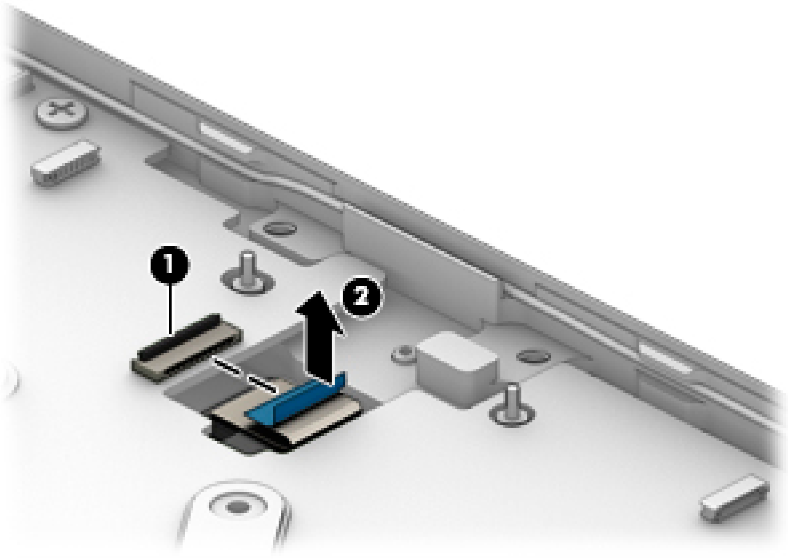
Description	Spare part number
Rear-facing webcam module (includes cable and double-sided adhesive)	L03251-001

Before removing the rear-facing webcam module, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).
5. Remove the front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42).

Remove the rear-facing webcam module:

1. Release the ZIF connector **(1)** to which the rear-facing webcam module cable is connected, and then disconnect the rear-facing webcam module cable from the system board.
2. Detach the rear-facing webcam module **(2)** from the back cover. (The rear-facing webcam module is attached to the back cover with double-sided adhesive.)



3. Remove the rear-facing webcam module.

Reverse this procedure to install the rear-facing webcam module.

HDMI/USB connector board

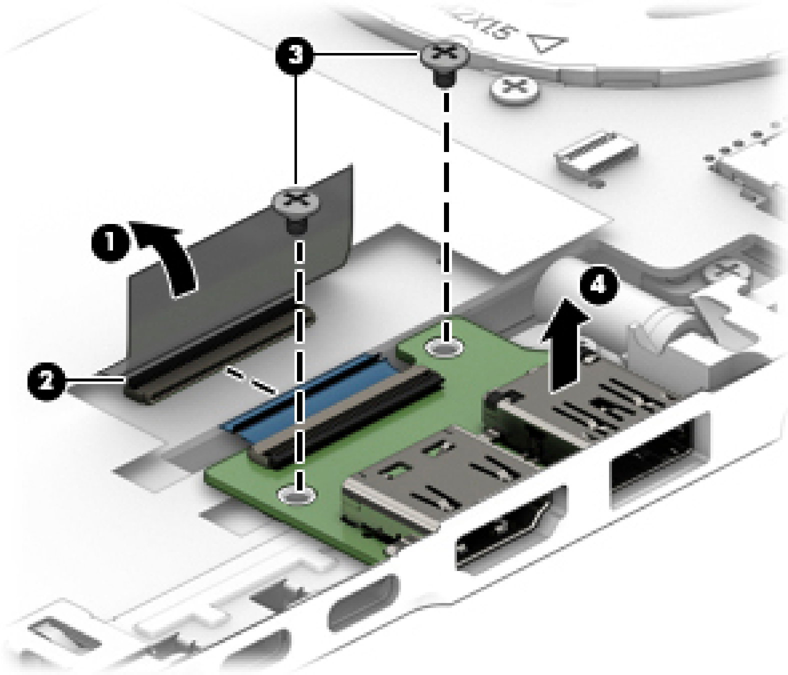
Description	Spare part number
HDMI/USB port connector board (includes HDMI port, USB port, and cable)	L03248-001

Before removing the HDMI/USB port connector board, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).

Remove the HDMI/USB port connector board:

1. Release the shielding material **(1)** that covers the HDMI/USB port connector board cable and connectors.
2. Release the ZIF connector **(2)** to which the HDMI/USB port connector board cable is connected, and then disconnect the HDMI/USB port connector board cable from the system board.
3. Remove the two Phillips M2.0×3.0 screws **(3)** that secure the HDMI/USB port connector board to the back cover.
4. Remove the HDMI/USB port connector board **(4)**.



NOTE: When installing the HDMI/USB port connector board, make sure the printing on the HDMI/USB port connector board cable is visible. If the printing is not visible, the HDMI/USB port connector board cable is installed incorrectly.

Reverse this procedure to install the HDMI/USB port connector board.

POGO pin connector cable

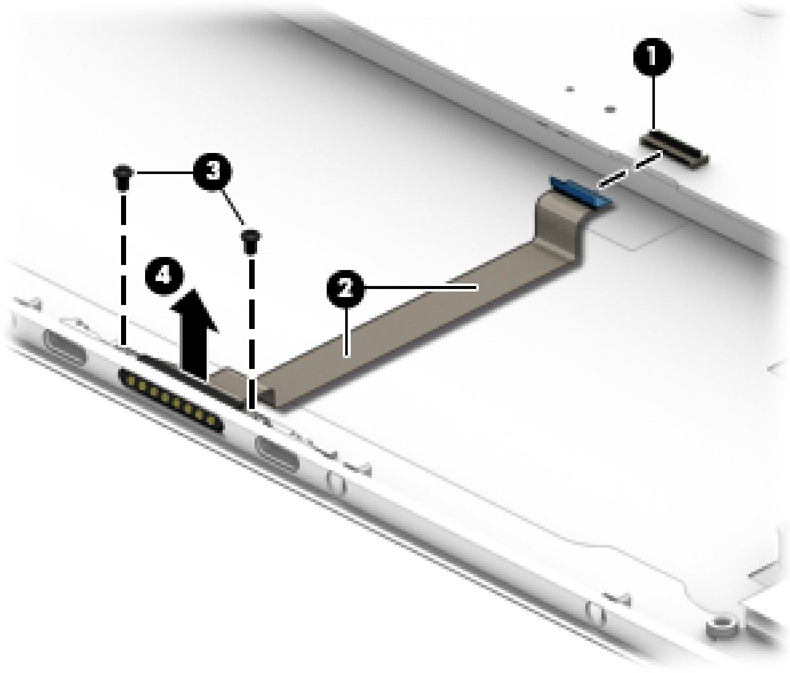
Description	Spare part number
POGO pin connector cable (includes POGO connector and double-sided adhesive)	L03262-001

Before removing the POGO pin connector cable, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).
5. Remove the battery (see Battery on page 39).

Remove the POGO pin connector cable:

1. Release the ZIF connector **(1)** to which the POGO pin connector cable is connected, and then disconnect the POGO pin connector cable from the system board.
2. Detach the POGO pin connector cable **(2)** from the back cover. (The POGO pin connector cable is attached to the back cover with double-sided adhesive in two locations.)
3. Remove the two Phillips M1.5×3.0 screws **(3)** that secure the POGO pin connector to the back cover.
4. Remove the POGO pin connector cable **(4)**.



5. Remove the POGO pin connector cable.

Reverse this procedure to install the POGO pin connector cable.

System board

NOTE: All system board spare part kits include a processor and replacement thermal material.

Description	Spare part number
Equipped with an Intel Core i7-8650U 1.90-GHz (turbo up to 4.20-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L13281-601
Equipped with an Intel Core i7-8650U 1.90-GHz (turbo up to 4.20-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows 10 operating system	L13281-001
Equipped with an Intel Core i7-8550U 1.80-GHz (turbo up to 4.00-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03241-601
Equipped with an Intel Core i7-8550U 1.80-GHz (turbo up to 4.00-GHz) quad core processor (8.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows 10 operating system	L03241-001
Equipped with an Intel Core i7-7600U 2.80-GHz (turbo up to 3.90-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03243-601
Equipped with an Intel Core i7-7600U 2.80-GHz (turbo up to 3.90-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L03243-001
Equipped with an Intel Core i5-8250U 1.60-GHz (turbo up to 3.40-GHz) quad core processor (6.0-GB L3 cache, 15-W), an Intel GT2 Integrated Graphics subsystem with UMA video memory, and the Windows 10 operating system	L03240-601
Equipped with an Intel Core i5-8250U 1.60-GHz (turbo up to 3.40-GHz) quad core processor (6.0-GB L3 cache, 15-W), an Intel GT2 Integrated Graphics subsystem with UMA video memory, and a non-Windows 10 operating system	L03240-001
Equipped with an Intel Core i7-7500U 2.70-GHz (turbo up to 3.50-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and the Windows 10 operating system	L03242-601
Equipped with an Intel Core i7-7500U 2.70-GHz (turbo up to 3.50-GHz) dual core processor (4.0-GB L3 cache, 15-W), an NVIDIA Quadro M620 N17M-Q3 graphics subsystem with discrete video memory, and a non-Windows operating system	L03242-001

Before removing the system board, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30).
5. Remove the front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42).

6. Remove the battery (see Battery on page 39).
7. Remove the front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42).

When replacing the system board, be sure to remove the following components from the defective system board and install them on the replacement system board:

- Fan/heat sink assembly (see Fan/heat sink assembly on page 49)
- Memory module(s) (see Memory module on page 53)
- Solid-state drive (see Solid-state drive on page 54)

Remove the system board:

1. Disconnect the following cables from the system board:

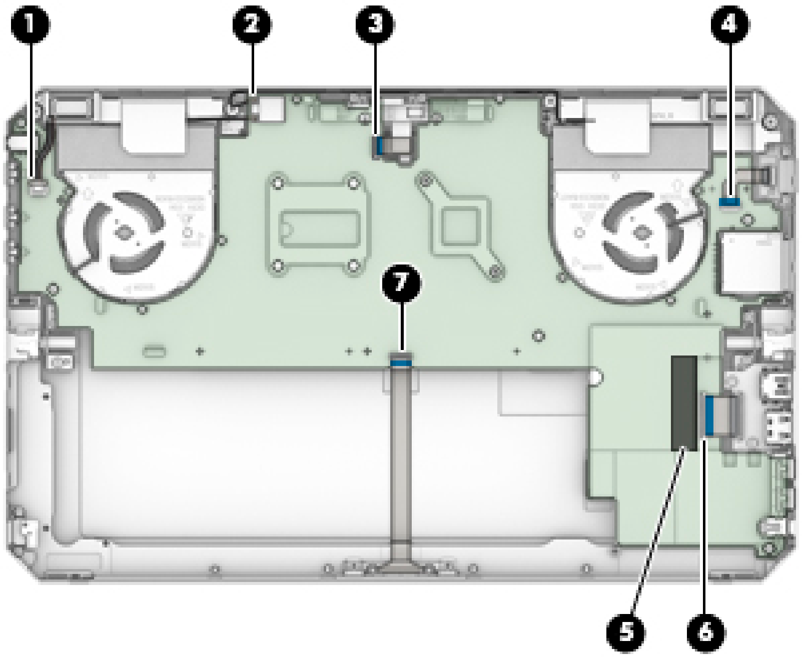
   (1) Left speaker cable

   (2) WLAN antenna cables

   NOTE: The #1 WLAN antenna cable connects to the WLAN module "#1/Main" terminal. The #2 WLAN antenna cable connects to the WLAN module "#2/Aux" terminal.

   (3) Rear-facing webcam module ZIF connector cable

   (4) Fingerprint reader board ZIF connector cable
2. Release the shielding material **(5)** that covers the HDMI/USB port connector board cable and connectors.
3. Release the ZIF connector **(6)** to which the HDMI/USB port connector board cable is connected, and then disconnect the HDMI/USB port connector board cable from the system board.
4. Release the ZIF connector **(7)** to which the POGO pin connector cable is connected, and then disconnect the POGO pin connector cable from the system board.

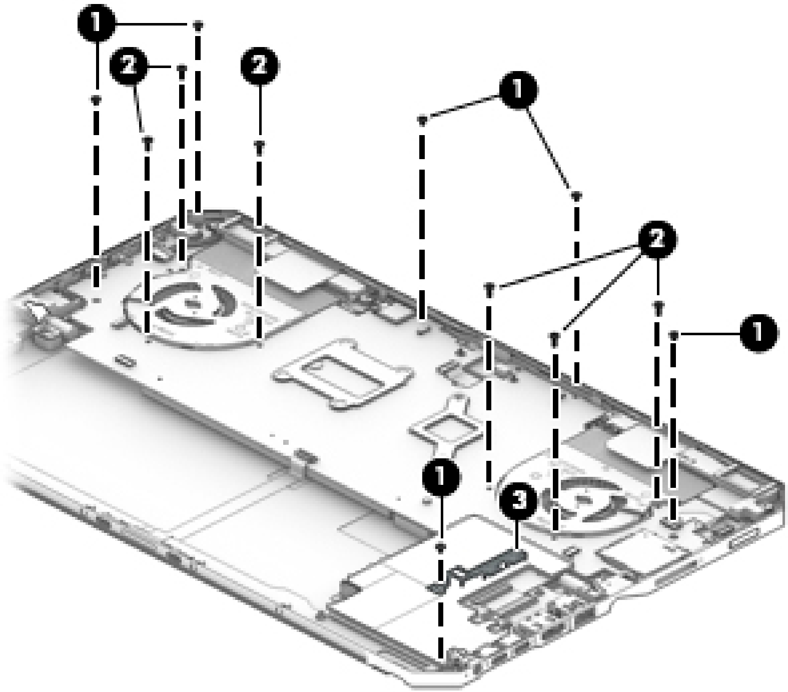


5. Remove the six Phillips M2.0×3.0 screws **(1)** that secure the system board to the back cover.

NOTE: The quantity of screws removed in step 6 varies depending on tablet model. Tablet models equipped with a graphics subsystem with discrete memory have six screws. Tablet models equipped with a graphics subsystem with UMA memory have three screws.

6. Remove the six (or three, depending on computer model) Phillips M2.0×5.6 screws **(2)** that secure the system board to the back cover.
7. Remove the support bracket **(3)**.

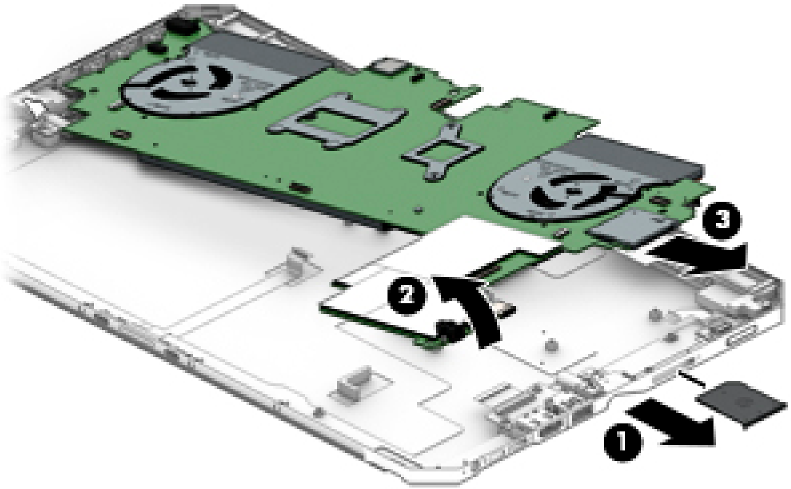
   The support bracket is available in the Bracket Kit, spare part number L03254-001.



8. Eject the smart card reader slot blank **(1)**.

   The smart card reader slot blank is available using spare part number L03261-001.
9. Lift the right side of the system board **(2)** until it rests at an angle.

10. Remove the system board **(3)** by sliding it up and to the right at an angle.



Reverse this procedure to install the system board.

Fan/heat sink assembly

Description	Spare part number
For use only on tablet models equipped with a graphics subsystem with discrete memory (includes two fan cables and replacement thermal material)	L03256-001
For use only on tablet models equipped with a graphics subsystem with UMA memory (includes fan cable and replacement thermal material)	L03257-001

Before removing the fan/heat sink assembly, follow these steps:

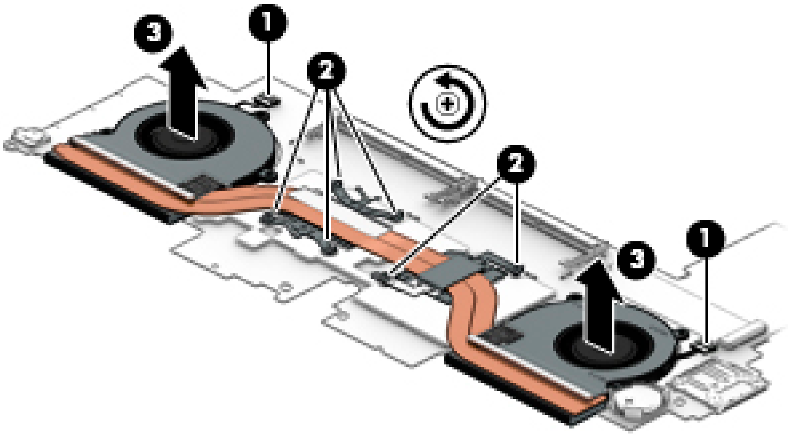
1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
   a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
   b. Battery (see Battery on page 39)
   c. System board (see System board on page 46)

Remove the fan/heat sink assembly:

1. Position the system board upside down with the rear edge toward you.

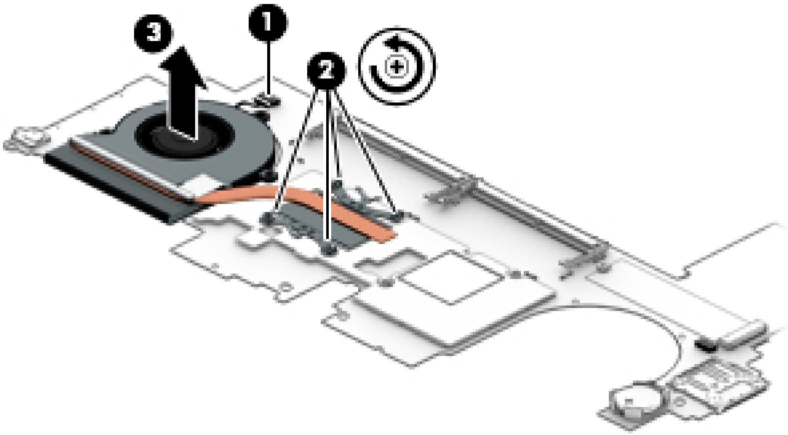
NOTE: Steps 2 through 4 apply to tablet models equipped with a graphics subsystem with discrete memory. See steps 5 through 7 for fan/heat sink assembly information for tablet models equipped with a graphics subsystem with UMA memory.

2. Disconnect the fan cables **(1)** from the system board.
3. Loosen the six Phillips captive screws **(2)** that secure the fan/heat sink assembly to the system board.
4. Remove the fan/heat sink assembly **(3)**.



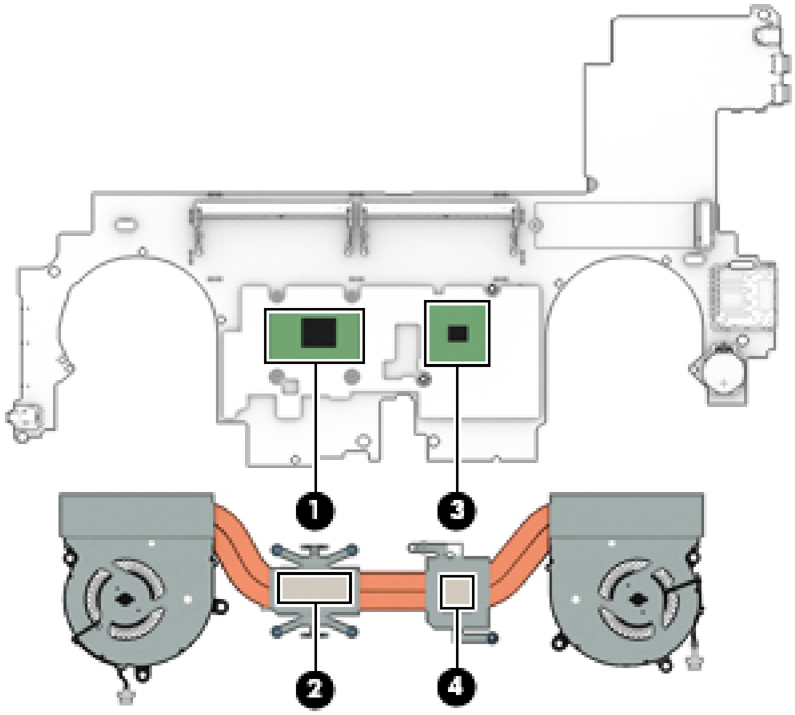
NOTE: Steps 5 through 7 apply to tablet models equipped with a graphics subsystem with UMA memory. See steps 2 through 4 for fan/heat sink assembly information for tablet models equipped with a graphics subsystem with discrete memory.

5. Disconnect the fan cable **(1)** from the system board.
6. Loosen the four Phillips captive screws **(2)** that secure the fan/heat sink assembly to the system board.
7. Remove the fan/heat sink assembly **(3)**.

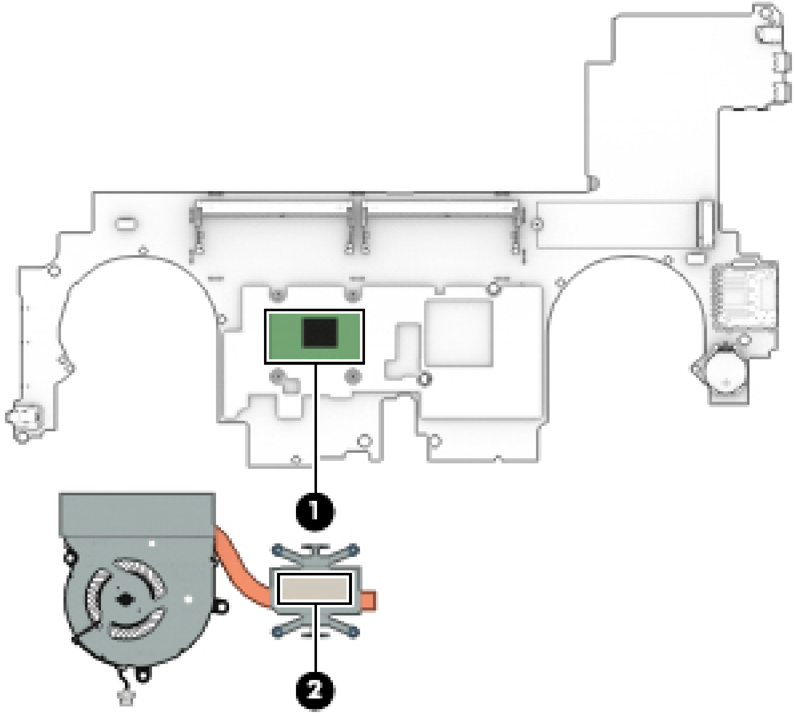


NOTE: The thermal material must be thoroughly cleaned from the surfaces of the fan/heat sink assembly and the system board components each time the heat sink is removed. Replacement thermal material is included with the fan/heat sink assembly and system board spare part kits.

Tablet models with a graphics subsystem with discrete memory: Thermal paste is used on the processor **(1)** and the heat sink section **(2)** that services it. Thermal paste is also used on the VGA component **(3)** and the heat sink section **(4)** that services it.



Tablet models with a graphics subsystem with UMA memory: Thermal paste is used on the processor **(1)** and the heat sink section **(2)** that services it.



Reverse this procedure to install the fan/heat sink assembly.

RTC battery

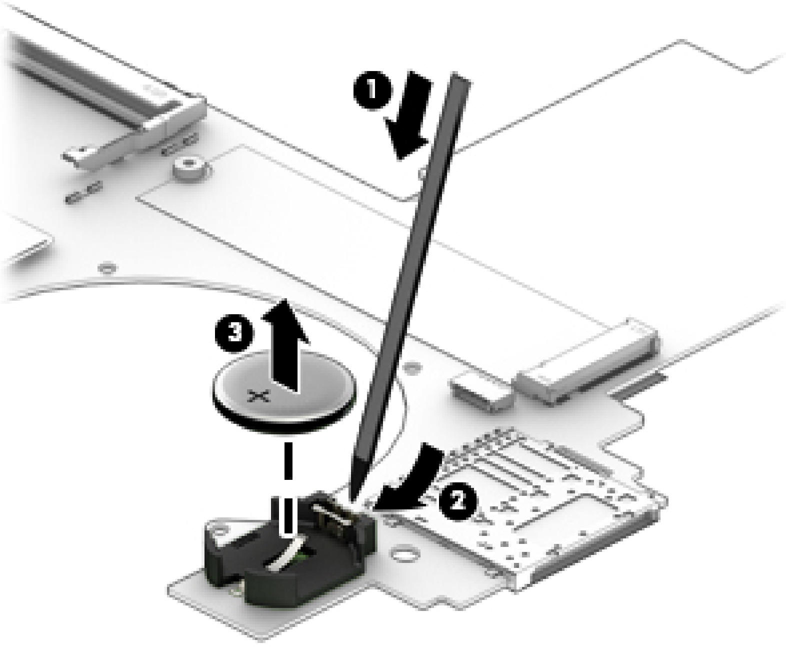
Description	Spare part number
RTC battery	L03258-001

Before removing the RTC battery, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
    a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
    b. Battery (see Battery on page 39)
    c. System board (see System board on page 46)

Remove the RTC battery:

1. Position the system board upside down with the rear edge toward you.
2. Insert a case utility tool **(1)** or other similar flat-tipped, plastic tool into the slot on the RTC battery socket.
3. Release the RTC battery **(2)** from the socket.
4. Remove the RTC battery **(3)**.



Reverse this procedure to install the RTC battery.

Memory module

Description	Spare part number
16-GB (2400, 1.2-V DDR4)	865396-855
8-GB (2400, 1.2-V DDR4)	862397-855
4-GB (2400, 1.2-V DDR4)	862398-855

Before removing the memory module, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
   a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
   b. Battery (see Battery on page 39)
   c. System board (see System board on page 46)

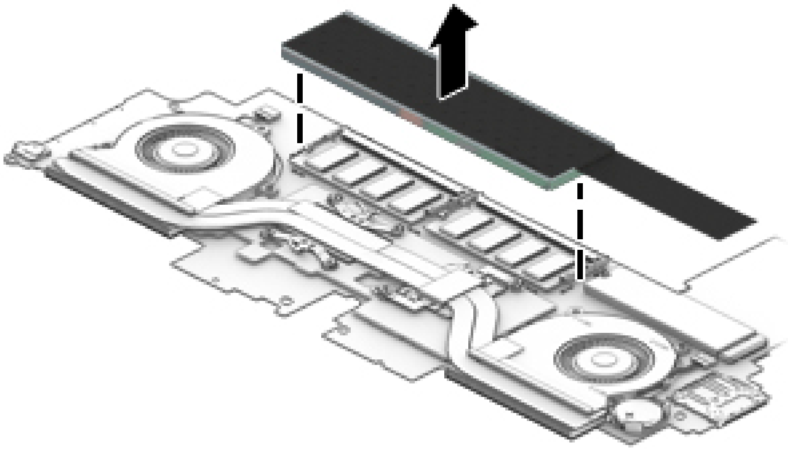
Remove the memory module:

1. Position the system board upside down with the rear edge toward you.

⚠ **WARNING!** Take care when removing the memory module shield. The shield has sharp edges that can result in injuries.

2. Remove the memory module shield that covers the memory module slots.

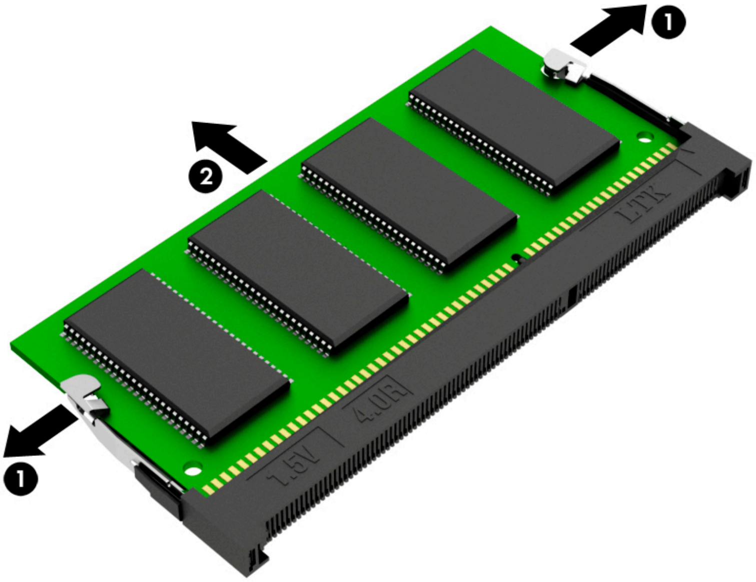
   The memory module shield is available in the Bracket Kit, spare part number L03254-001.



3. Spread the retaining tabs **(1)** on each side of the memory module slot to release the memory module. (The memory module tilts up.)

4. Remove the memory module **(2)** by pulling it away from the slot at an angle.

NOTE: Memory modules are designed with notches to prevent incorrect insertion.



Reverse this procedure to install a memory module.

Solid-state drive

Description	Spare part number
1-TB, 2280.M2, PCIe-3×4, NVMe, DS solid-state drive	L11069-001
1-TB, 2280.M2, PCIe-3×4, SS, HP Z Turbo Drive solid-state drive with TLC	L12500-001
512-GB, 2280.M2, PCIe-3×4, NVMe, HP Z Turbo Drive solid-state drive	L11071-001
512-GB, 2280, PCIe-3×4, SED, HP Z Turbo Drive solid-state drive with Opal2 and TLC	L11072-001
512-GB, M2, SATA-3, FIPS solid-state drive with TLC	L11067-001
256-GB, 2280.M2, PCIe-3×4, NVMe, SS, HP Z Turbo Drive solid-state drive with TLC	L11070-001
256-GB, PCIe, NVMe, solid-state drive, HP Z Turbo Drive with MLC	L11073-001
128-GB, M.2, SATA-3 solid-state drive	L11068-001

Before removing the solid-state drive, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.

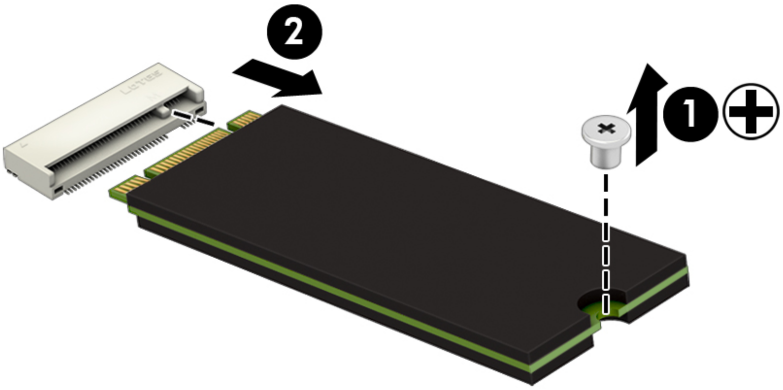
2. Disconnect all external devices connected to the tablet.

3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
    a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
    b. Battery (see Battery on page 39)
    c. System board (see System board on page 46)

Remove the solid-state drive:

1. Position the system board upside down with the rear edge toward you.
2. Release the Mylar shield **(1)** that secures the solid-state drive to the system board.
3. Remove the Phillips M2.0×3.0 screw **(2)** that secures the drive to the system board. (The solid-state drive tilts up.)
4. Remove the solid-state drive **(3)** by pulling it away from the connector.

NOTE: Solid-state drives are designed with notches to prevent incorrect insertion.



Reverse this procedure to install the solid-state drive.

Speakers

Description	Spare part number
Speakers (includes left and right speakers and cables)	L03253-001

Before removing the speakers, follow these steps:

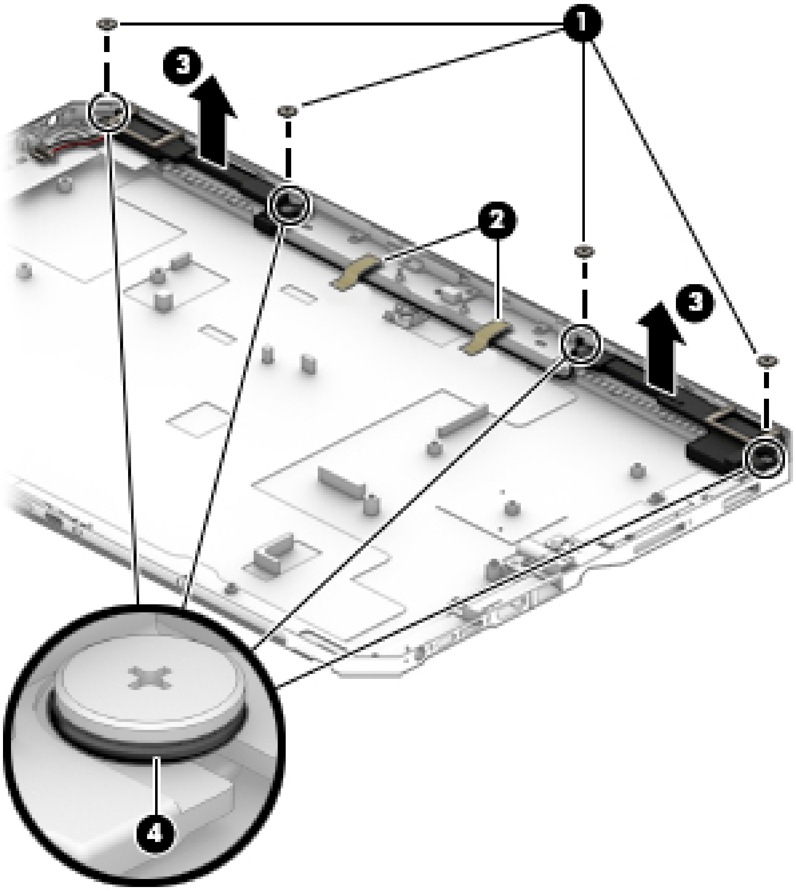
1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.

3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
   a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
   b. Battery (see Battery on page 39)
   c. System board (see System board on page 46)

Remove the speakers:

1. Remove the four Phillips M2.0×3.5 screws **(1)** that secure the speakers to the back cover.
2. Release the retention tape **(2)** that secures the speaker cable to the back cover.
3. Remove the speakers **(3)**.

NOTE: When removing the speakers, make note of the location of the four rubber isolators **(4)**. Failure to properly install or damage to these isolators can result in degraded speaker performance.



Reverse this procedure to install the speakers.

Hinges

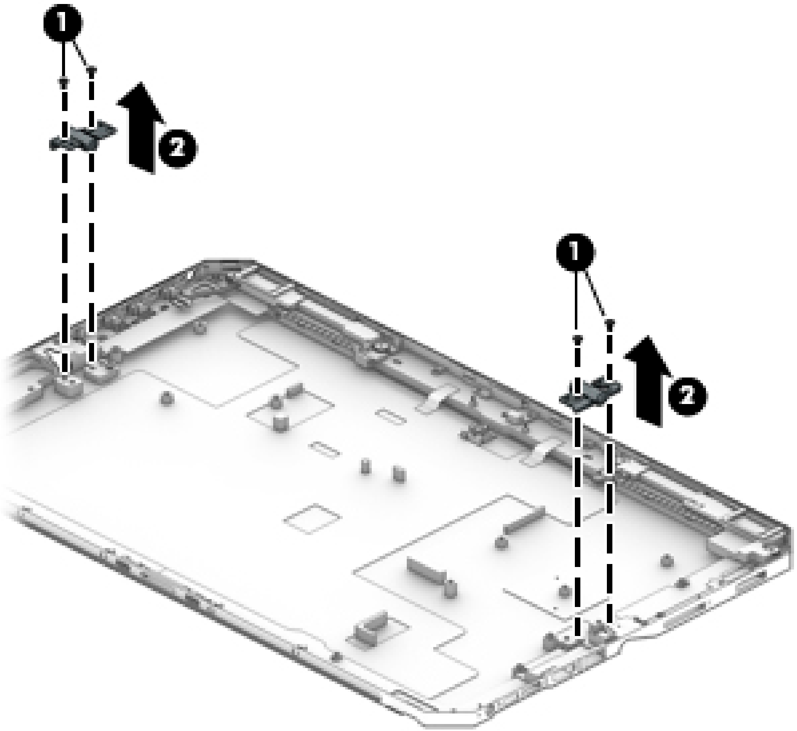
Description	Spare part number
Hinges (2, available in the Kickstand Hinge Kit, includes left and right hinges)	L13279-001

Before removing the hinges, follow these steps:

1. Shut down the tablet. If you are unsure whether the tablet is off or in Hibernation, turn the tablet on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the tablet.
3. Disconnect the power from the tablet by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the tablet.
4. Remove the display panel assembly (see Display panel assembly on page 30), and then remove the following components:
    a. Front-facing webcam/microphone module (see Front-facing webcam/microphone module on page 42)
    b. Battery (see Battery on page 39)
    c. System board (see System board on page 46)

Remove the hinges:

1. Remove the four Phillips M2.0×4.7 screws **(1)** that secure the hinges to the back cover.
2. Remove the hinges **(2)**.



Reverse this procedure to install the hinges.

6 Troubleshooting guide

This chapter is primarily focused on troubleshooting HP Mobile Workstations and HP Notebooks. The information is provided so that you can solve problems yourself or at least narrow down what may be causing the problem. Based on some of the most common symptoms, this chapter helps to identify logical steps and available resources or tools for resolving an issue. HP recommends that you follow the instructions carefully, observe safety precautions, and note any observations or results. Capturing this information may help identify and resolve the problem faster.

⚠ WARNING! To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) outlet that is easily accessible at all times.
- Disconnect power from the equipment by unplugging the power cord from the AC outlet.
- Before disassembling notebooks, always disconnect power and remove the battery.

⚠ CAUTION: Static electricity can damage the electronic components of the computer. To prevent damage to the computer, carefully observe the electrostatic discharge precautions.

- Discharge static electricity by briefly touching a grounded metal object before you begin.
- Work on a static-free mat.
- Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to the ground.
- Create a common ground for the equipment you are working on by connecting the static-free mat, static strap, and peripheral units to that piece of equipment.
- Refer to the Electrostatic Discharge Section of the Maintenance & Service Guide for more information.

CAUTION: The computer includes customer self-repair parts and parts that should only be accessed by an authorized service provider. See the chapter titled "Removal and replacement procedures for Customer Self-Repair parts," for details. Accessing parts described in the chapter titled "Removal and replacement procedures for authorized service provider only parts" can damage the computer or void the computer warranty.

Resources

HP Resource Tool	Description	Link
HP Elite Support	Provides live HP Premium support (available 24/7) to Elite computers.	http://www8.hp.com/us/en/ads/elite-products/overview.html
HP Support Center	Provides important support, such as warranty, support cases, drivers, Customer Advisories, Customer and Security Bulletins, and Product Change Notices.	http://h20565.www2.hp.com/portal/site/hpsc
Subscribers Choice	Allows you to sign up for HP product updates.	http://www8.hp.com/us/en/subscribe/
HP Support Forums	Provide discussions about HP products and issues.	http://h30434.www3.hp.com/psg/
Service Access Workbench (SAW) (Available for technicians and Business Partners only)	Provides navigable content intended for use by internal and outsourced call center staff and can be a resource for support and product division professionals.	http://sawpro.atlanta.hp.com/km/saw/home.do
Vendors' web sites	Provide additional information for associated components such as Intel (processor, WLAN), Microsoft (Windows 7/8/10), AMD/NVidia (GPU), and so on.	http://www.intel.com/content/www/us/en/homepage.html http://www.amd.com http://www.nvidia.com

General troubleshooting steps

A basic logic should be used when troubleshooting computer issues. This section will help you become familiar with troubleshooting methodology and efficiently resolve problems. Proceed through the steps in the following table until the issue is resolved, and then move on to the next step that is relevant to the issue. For example, if you resolve a memory issue using the HP PC Diagnostics (UEFI) tool in step 6, you can then move on to step 10 to reseat the memory into its memory slot.

NOTE: General troubleshooting steps do not have to be followed in a specific order if an issue does not apply.

Table 6-1 Troubleshooting methodology and general troubleshooting steps

Identify issue	Analyze issue	Resolve issue	Verify solution
1. Understand the issue on page 60 2. Examine the environment on page 62 3. Perform a visual inspection of hardware on page 63 4. Update BIOS and drivers on page 63	5. Remove or uninstall recently added hardware, software on page 63 6. HP Hardware Diagnostics and Tools on page 64 7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68	8. Hard reset on page 70 9. Soft reset (Default Settings) on page 71 10. Reseat cables and connections on page 72 11. Test with minimum configuration on page 72 12. Test with verified working configuration (hardware and/or operating system) on page 74 13. Replace the system board on page 74	Verify solution on page 75

Identify the issue

1. Understand the issue

It is important to understand the issue that occurred, including related symptoms. It helps to understand the basic computer boot-up sequence as well as the failure itself. The boot-up sequence and associated failures are described below.

Boot up sequence

The computer performs several steps after you press the power button or restart the computer.

It is important to understand where in the boot-up sequence the symptoms occur. The following table lists the phases of the boot-up sequence and explains the symptoms that may occur in each phase. For example, a blue screen error (BSOD) often occurs during the performance phase.

Table 6-2 Boot-up sequence

Item	Procedure
Power-on	After power button is pressed, the computer boots after all internal power rails (i.e., 5V, 3.3V) are stable. Confirm that power lights are on fan is spinning. Common issues: all lights are off; troubleshooting lights are on; does not boot; video is absent.
POST (UEFI/BIOS)	Power-On Self-Test (POST) verifies that hardware components (processor, hard drive, memory, etc.) are functional. When POST is complete, the HP logo displays briefly and then disappears. If there are errors, the computer may exhibit blinking lights and POST error messages Common issues: lights blink, error message appears, hangs.
Performance (operating system)	System boots to operating system, and Windows logo screen appears. Common issues: hangs (lock up/freezes), blue screen, video distorted, driver conflict, slow performance, display issue (dead pixel), I/O issue (no speaker sound), wireless/audio unavailable, noise. See Analyze the issue on page 63 table below for detailed troubleshooting information).

Failure classification

Failure classification is a breakdown of different types of failures and symptoms that could occur during the boot-up sequence. Table 3 and table 4 represent the failure classification for common notebook failures.

Table 3 categorizes failures by the boot-up sequence.

1. Power-on: Common issues are No Power, Recycle/Reboot, etc.
2. POST: Common issues are No Boot (have power), Light Flash or Diagnostics Error.
3. Performance: Common issues are Intermittent Loss of Power, Blue Screen, Hang, etc. In many cases, issues may be identified and associated with a particular hardware (i.e., display, storage).

   Table 4 categorizes failures by hardware.
4. Display
5. I/O devices (Input/Output)
6. Storage
7. Mechanical

A single symptom can be listed under different groups. For example, No Video can belong to (1) Power-on or (4) Display; but Flickering when powered should be listed in (4) Display. Or, in another example, a blue screen can be caused by a driver conflict in Performance (4), but it can also be caused by a defective hard drive under (6) Storage. Therefore, failures that share similar symptoms are noted.

If possible, make a record of the failure symptom, the phase of the boot-up sequence where the failure occurs, and the most likely location in the failure tree (Table 6-3 Failure classification by boot-up sequence on page 61 and Table 6-4 Failure classification by hardware devices and mechanical on page 62). This will help isolate the issue and indicate the next steps. For example, when the computer is running the operating system, it may experience an issue with (4) Display, (5) I/O devices (keyboard, wireless, and so on), (6) Storage, or (7) Mechanical components (stuck buttons, thermal shutdown, and so on).

NOTE: “Uncategorized” is used if an issue found is not listed. For example, Bluetooth is offered on certain hardware configurations; therefore, a Bluetooth issue can be classified under “I/O Device” if needed.

Failure classification by boot-up sequence

Table 6-3 Failure classification by boot-up sequence

1. Power-on	2. POST	3. Performance
1. No Power on page 77	1. No video (with power) on page 84	1. Intermittent shutdown on page 88[a]
2. Intermittent power-on, shutdown, reboot on page 79[a]	2. Blinking lights on page 85	2. Blue screen (BSOD) error on page 114[b]
3. AC adapter issue on page 80	3. Diagnostics error messages on page 86	3. Freeze at Windows Logo (hang/lockup) on page 92
4. Battery not recognized, not charging on page 81	4. BIOS password on page 87	4. Electromagnetic Interference (EMI) on page 93
5. Battery discharges too fast on page 82		5. No wake up on page 93
6. Burnt smell on page 83		6. Unresponsive on page 95
		7. Slow performance on page 95[c]
		8. HP Smart Adapter warning message on page 96
		9. Incorrect time and date on page 97

[a,b,c] similar symptoms

Failure classification by hardware devices and mechanical

Table 6-4 Failure classification by hardware devices and mechanical

4. Display	5. I/O devices	6. Storage	7. Mechanical
1. Display anomalies on page 97	1. Keyboard on page 103	1. Hard drive/solid-state drive not recognized on page 112	1. Fan/heat sink assembly on page 49
2. Dead pixel on page 99	2. Keyboard point stick on page 104	2. No boot to operating system (no read/write error) on page 112	2. Noise (sound) on page 116
3. No video (internal) on page 99[d]	3. Keyboard backlight on page 104	3. Read-write error on page 113	3. Fan runs constantly on page 117
4. No video (external) on page 100[d]	4. TouchPad on page 105	4. Slow performance on page 95[c]	4. HP Thermal Monitor on page 67
5. DisplayPort/VGA on page 100	5. Network connectivity wireless (WLAN) on page 105	5. Blue screen (BSOD) error on page 114[b]	5. Stuck power button on page 119
6. HDMI on page 100	6. WWAN on page 106	6. Noisy hard drive on page 114	
7. No or bad external video via docking on page 101	7. USB on page 107		
8. Incorrect or missing color/ distorted image on page 101	8. Smart card reader on page 108		
9. Touch screen on page 102	9. Speaker, headphone - audio issues on page 109		
	10. Thunderbolt (TB) on page 110		

[b,c,d] similar symptoms

2. Examine the environment

It is important to examine the computer's environment. If you can quickly identify the cause of the issue, fewer resolution steps may be needed. Perform the following environment inspections:

- Check all cables and connections to be sure that there are no loose connections.
- Confirm that power sources are good, such as wall power type/adapter (110V/220V ac), power strip. Test with a verified working AC outlet.
- Check for compatibility issues between the computer and third-party devices, peripherals, noncertified devices, incompatible hardware (i.e., Mac OS device). Incompatibility can result in blue screen errors, improper operation, and so on.
- Isolate the computer from sources of electromagnetic interference (EMI), such as cell phones, 2-way radios, floor mats, fans (and other electronic motors). EMI may contribute to a display freeze issue or lock-up.

3. Perform a visual inspection of hardware

It is important to do a visual inspection of the hardware itself. Perform physical inspection of the computer:

- Look for abnormalities such as a cracked display, dented battery, broken latches for battery bay, keyboard key caps popped out, dust over connectors, liquid spill over keyboard, etc.
- Look for signs of drop, movement, or vibration that may cause internal and external loose connections.

4. Update BIOS and drivers

IMPORTANT: Whenever possible, update to the latest BIOS, firmware, and drivers before troubleshooting.

Note that some customer company policies prohibit updates. Check your company policy before taking action.

The updates may include fixes for your computer issues, and they may also enhance system performance. HP continually improves the update process to make it easier. The BIOS update can be done locally through a manual process, through an automatic installation, or through a remote installation on multiple units.

Manually updating BIOS and drivers

- See the Computer Setup chapters to manually update BIOS and drivers.
- Refer to specific BIOS update installation instructions that accompany the download.

Remotely deploying BIOS and drivers

Instead of manually searching for and downloading each SoftPaq, users and IT personnel can use two tools to identify and download all appropriate SoftPaqs for the selected HP models.

- HP SoftPaq Download Manager (SDM) is a software tool designed to streamline the download, extraction, and installation process of SoftPaqs, including BIOS and drivers.
- HP System Software Manager (SSM) is a software tool designed to simplify the deployment of SoftPaqs to HP computers.

Analyze the issue

5. Remove or uninstall recently added hardware, software

HP has designed this computer and validated it using a full-range hardware and software qualification matrix. If an issue appears to have started recently, it may be related to the recent addition of hardware or software. A good method to determine the root cause is to remove recently added components or uninstall applications one at a time and restart the computer when necessary.

IMPORTANT: After you have completed the process of uninstalling hardware or software and are ready to reinstall, when installing a new device be sure that it is seated properly and all cables are correctly connected. After installing the device, restart the computer and make sure the new device is powered on. In addition, if the new device is a root cause of a problem, it could cause a conflict in drivers or incompatibility issues with other programs installed. For any new hardware you have added, be sure to install the latest drivers available from the device vendor website.

6. HP Hardware Diagnostics and Tools

HP offers different diagnostics and tools to diagnose hardware failure. This section describes how to use some of these tools. Make sure to check for the latest versions before use.

HP PC Hardware Diagnostics (UEFI)

HP PC Hardware Diagnostics is a Unified Extensible Firmware Interface (UEFI) that allows you to run diagnostic tests to determine whether the computer hardware is functioning properly. The HP PC Hardware Diagnostics (UEFI) tool is built within BIOS (basic memory and hard drive diagnostics only), or within new hard drives themselves. These drives contain more advanced versions of the diagnostic tool than the BIOS-based version.

In addition, for HP authorized service partners and IT professionals who need to support a mixed environment of older and newer HP/Compaq PCs, the http://www8.hp.com/us/en/campaigns/hpsupportassistant/pc-diags.html?jumpid=va_r602_us/en/any/pps/pl_ot_ob_ds_pd/HP_PC_Hardware_Diagnostics_cc/dt is a diagnostic tool that supports a wide range of HP Desktop and Notebook computers.

The tool runs outside the operating system so that it can isolate hardware failures from issues that are caused by the operating system or other software components. In reality, many problems can be determined using this tool if the issue is a defective part or a loose connection (i.e., reseating keyboard cable after the tool reports a keyboard error).

The tool has three major functions:

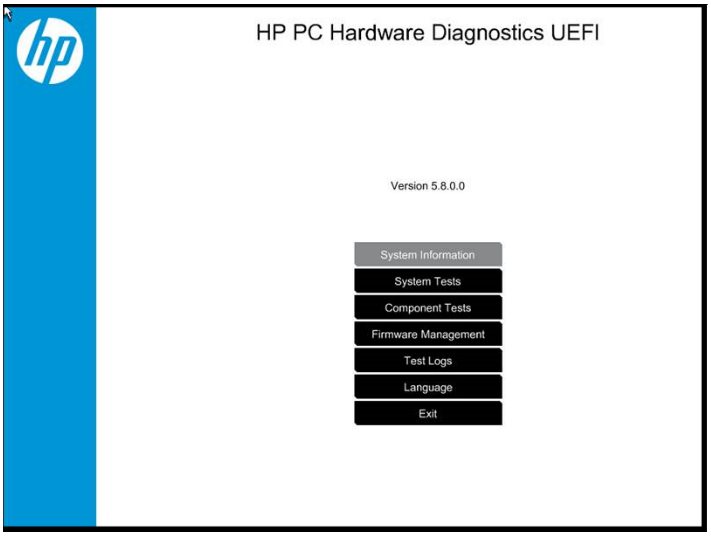
- System Tests - Check the computer's hardware to assure everything is functioning properly. If your system won't boot into Windows, try the Quick System Test. For more comprehensive testing, use the Extensive System Test option. If the System Test did not detect a hardware problem, continue with the Component Tests.
- Component Tests – Focus on selected hardware components in your computer.
- Firmware Management – Update your computer's BIOS to the latest version (available separately) or roll back to a previous version.

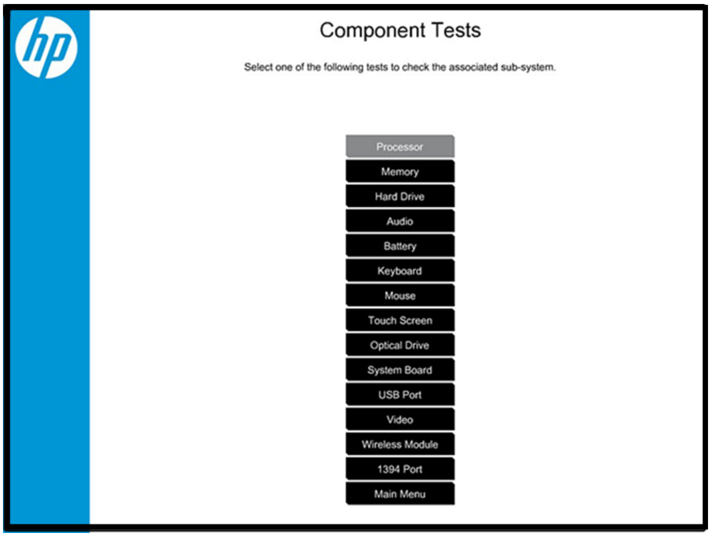
To start HP PC Hardware Diagnostics (UEFI):

1. Turn on or restart the computer, quickly press the esc button on the computer, and then press F2. The BIOS searches three places for the diagnostic tools, in the following order:
   a. Connected USB drive
   b. Hard drive
   c. BIOS

2. When the diagnostic tool opens, use the keyboard arrow keys to select the type of diagnostic test you want to run, and then follow the on-screen instructions.

   Screen shot appearance may vary.


HP PC Hardware Diagnostics UEFI
Version 5.8.0.0
System Information
System Tests
Component Tests
Firmware Management
Test Logs
Language
Exit


Component Tests

Select one of the following tests to check the associated sub-system.

Processor
Memory
Hard Drive
Audio
Battery
Keyboard
Mouse
Touch Screen
Optical Drive
System Board
USB Port
Video
Wireless Module
1394 Port
Main Menu

NOTE: Users should utilize this tool, especially when the computer cannot boot to Windows.

NOTE: If a component fails a test, write down the information so it is available when contacting support. The information is also available in **Test Logs** on the Main Menu.

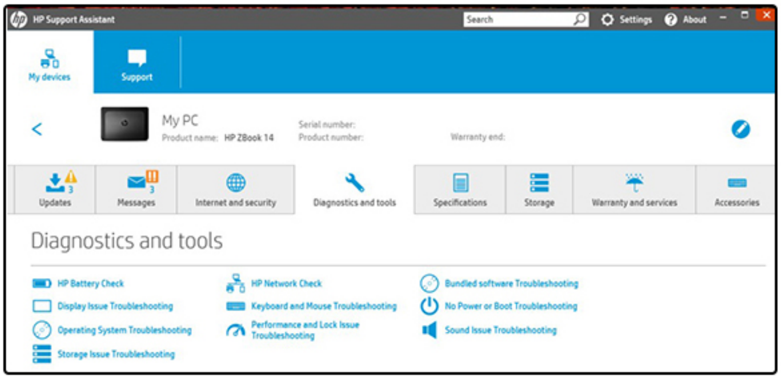
For more information, see the chapter titled “Using HP PC Hardware Diagnostics (UEFI).”

HP Support Assistant (HPSA)

HP Support Assistant (HPSA) helps you maintain peak performance and resolve problems through automatic updates, built-in diagnostics, and a variety of assistance options. HPSA is preinstalled on every new HP PC with Windows 7, Windows 8, or Windows 10. HP is continually improving this tool. Please verify the latest version is installed to receive the most benefit. For more information, see http://www.hp.com/go/hpsupportassistant.

NOTE: HPSA can be used only if the computer boots into Windows. If the computer does not boot into Windows, use HP PC Hardware Diagnostics (UEFI) instead.

HPSA also integrates diagnostics and tools that help resolve issues. See example screen shots as follows.


HP Support Assistant
Search
Settings
About
My devices
Support
Updates
Messages
Internet and security
Diagnostics and tools
Specifications
Storage
Warranty and services
Accessories
HP Battery Check
Display Issue Troubleshooting
Operating System Troubleshooting
Storage Issue Troubleshooting
HP Network Check
Keyboard and Mouse Troubleshooting
Performance and Lock Issue Troubleshooting
Bundled software Troubleshooting
No Power or Boot Troubleshooting
Sound Issue Troubleshooting

My PC

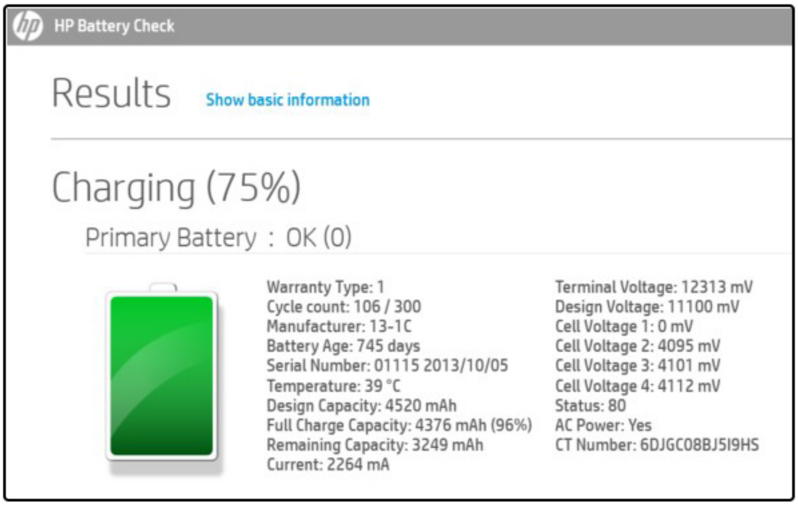
Product name: HP ZBook 14

Serial number:

Product number:

Warranty end:

Diagnostics and tools



HP Battery Check

Results

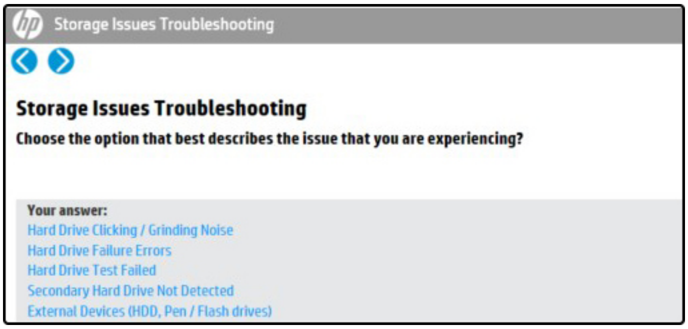
Show basic information

Charging (75%)

Primary Battery : OK (0)

Warranty Type: 1
Cycle count: 106 / 300
Manufacturer: 13-1C
Battery Age: 745 days
Serial Number: 01115 2013/10/05
Temperature: 39 °C
Design Capacity: 4520 mAh
Full Charge Capacity: 4376 mAh (96%)
Remaining Capacity: 3249 mAh
Current: 2264 mA

Terminal Voltage: 12313 mV
Design Voltage: 11100 mV
Cell Voltage 1: 0 mV
Cell Voltage 2: 4095 mV
Cell Voltage 3: 4101 mV
Cell Voltage 4: 4112 mV
Status: 80
AC Power: Yes
CT Number: 6DJGC08BJ5I9HS



Storage Issues Troubleshooting

Storage Issues Troubleshooting

Choose the option that best describes the issue that you are experiencing?

Your answer:
Hard Drive Clicking / Grinding Noise
Hard Drive Failure Errors
Hard Drive Test Failed
Secondary Hard Drive Not Detected
External Devices (HDD, Pen / Flash drives)

HP BIOS Configuration Utility (BCU)

HP BCU is a free utility that captures the BIOS settings and their values. This tool provides a text file of the computer's BIOS configuration. This can help identify any settings that may be contributing to an issue.

In some cases, it may help to compare this BIOS text file to the default settings of the computer.

For more information, see the http://ftp.hp.com/pub/caps-softpaq/cmit/whitepapers/BIOS_Configuration_Utility_User_Guide.pdf.

NOTE: HP recommends that you reset BIOS before trying BCU. Resetting the BIOS is always available and relatively quick to try, whereas BCU takes extra time and effort.

HP Image Diagnostic Tool

Available to HP Authorized Support Partners (ASPs) and users from the ftp://ftp.hp.com/pub/idr/ImageDiags/, this tool collects information about the current state of the computer, including product serial number, platform and BIOS information, and information about user-installed software and hardware components. HP encourages you to review the report before sending it to support. The report may assist you with diagnostics and solutions to problems you encounter.

HP Thermal Monitor

NOTE: Available only to authorized service providers/technicians.

Available only for HP internal use, HP Thermal Monitor can be used to stress the processor and GPU and monitor the temperature values of various components in the system. The components that are currently monitored include the processor, GPU, ACPI thermal zones, hard drive, and battery. The tool reads the temperatures of the components, logs the data, and helps to determine whether the computer would overheat in the event of thermal shutdown, fan spinning loud, etc.

Non HP diagnostics tools

Windows-to-Go USB

Windows-To-Go USB is a Microsoft-based tool for Enterprise editions of Windows that can help in troubleshooting. You can find a process online about how to create a live Windows USB drive. For more information, see https://technet.microsoft.com/en-us/library/hh831833.aspx.

Intel Processor Diagnostic Tool

Determine what processor is in your computer and verify the processor operating frequency. The tool also tests specific processor features and performs a stress test on the processor. For more information, see http://www.intel.com/support/processors/sb/CS-031726.htm?iid=subhdr+tools_procdiagtool.

7. Status lights, blinking light codes, troubleshooting lights, and POST error messages

Carefully observe any behavior the computer may be exhibiting: status lights, blinking lights, and POST error messages during boot. It is important to understand what these indicators mean.

Status lights

See the chapter titled “External Component Identification” for light locations. The following table describes basic lights on the computer.

Component	Description
Power button	When the computer is off, press the button to turn on the computer. When the computer is on, press the button briefly to initiate Sleep (Windows) or Suspend (Linux). When the computer is in the Sleep state, press the button briefly to exit Sleep (Windows) or Suspend (Linux). When the computer is in Hibernation, press the button briefly to exit Hibernation. CAUTION: Pressing and holding down the power button results in the loss of unsaved information. If the computer has stopped responding and operating system shutdown procedures are ineffective, press and hold the power button.
AC adapter and battery light	White: The computer is connected to external power and the battery is charged from 90 to 99 percent. Amber: The computer is connected to external power and the battery is charged from 0 to 90 percent. Blinking amber: A battery that is the only available power source has reached a low battery level. When the battery reaches a critical battery level, the battery light begins blinking rapidly. By default, the critical battery level is defined in Power Options as 5%. Off: The battery is fully charged.

Blinking light codes

During startup, the computer may not boot properly. If this occurs, blinking light codes that will help identify what is causing the issue. The computer uses the blinking lights below to identify a hardware component that reports an error during startup. For more information, see Blinking lights and boot error codes on page 120.

Table 6-5 Boot-error codes

Blink codes	Error
Amber battery light: blinks 1 Hz continuously	Embedded controller unable to load firmware
Caps/num lock lights = 1 blink	Processor not executing code
Caps/num lock lights = 2 blinks	BIOS recovery code unable to find valid BIOS recovery image
Caps/num lock lights = 3 blinks	Memory module error
Caps/num lock lights = 4 blinks	Graphics controller error
Caps/num lock lights = 5 blinks	System board error
Caps/num lock lights = 6 blinks	Intel Trusted Execution Technology (TXT) Error
Caps/num lock lights = 7 blinks	Sure Start unable to find valid BIOS Boot Block image
Caps/num lock lights = 8 blinks	Sure Start has identified a problem (Manual Recovery Policy Set)

POST error messages

The Power-On Self-Test (POST) is a series of diagnostic tests that runs automatically when the computer is powered on. If the POST encounters a problem, visual error messages are displayed before the operating system starts. POST checks the following items to ensure that the computer system is functioning properly:

- Memory
- Processors
- BIOS
- Mass storage devices
- Fans

The following table describes errors encountered during HP PC Hardware Diagnostics (UEFI).

Table 6-6 System diagnostics failure codes and user actions

Test description	Failure description	Error code	Suggested user actions
Startup Test	Memory module	200	Attempt to reseat the memory module and then repeat the test. For details on troubleshooting issues related to the memory module, search for support documentation at http://www.hp.com/support.
Startup Test	Hard Disk 1 SMART	301	Attempt to reseat the hard drive and repeat the test. The hard drive may have failed.
Boot Device Manager	Boot device not found	3F0	Reset BIOS. Then reseat the hard drive and repeat the test.
BIOS Recovery	BIOS Recovery Occurred	500	This message indicates that BIOS recovery was completed successfully. No further action is required.

Table 6-6 System diagnostics failure codes and user actions (continued)

Test description	Failure description	Error code	Suggested user actions
BIOS Application	BIOS Application Error	501	The BIOS installation may have become corrupted. Download the latest version of the BIOS and install it. If reinstalling the BIOS fails, contact support for further assistance.
CMOS Recovery	CMOS Recovery Occurred	502	This message indicates that CMOS recovery was completed successfully. No further action is required.
Battery Check	Primary Battery Replace	601	This message indicates that the primary battery has very low capacity. Search for support documentation at http://www.hp.com/support for details on using the HP Support Assistant to verify the battery capacity and, if necessary, order a replacement.
Wireless Modules	Not installed or responding	701	Reseat the wireless LAN adapter module and antennas. Because seating or reseating a wireless LAN adapter is unique to each computer model, see the WLAN module removal section in the removal and replacement chapter for further details. Contact support if third-party wireless adapters are installed in the computer.
Fan	Fan not operating correctly	90B	The system fan may be malfunctioning. Replace the fan.

Resolve the issue

8. Hard reset

A hard reset (or forced reset) erases all information in the computer's memory and may restore functionality. Resetting the computer forces the system to clear and reestablish the connections between the BIOS and the hardware. For more information, see http://support.hp.com/us-en/document/c01684768.

Performing a hard reset might fix the following common conditions:

- Windows stops responding.
- Computer stops before Windows loads, indicated by incomplete boot-up, blinking cursor on a black background, and errors relating to operating system not found or a missing drive.
- Display suddenly goes blank and stays blank.
- Software freezes.
- Keyboard stops responding.
- The computer does not exit Sleep or Suspend state.
- An external device stops responding. Turn off the power to that device in addition to performing the steps in this document.

Before performing a hard reset, you must disconnect or remove all peripheral devices. You should start and test the computer by itself, and if the problem is not resolved, reconnect one peripheral device at a time. To resolve the startup or operational problem, run HP Support Assistant, or manually install all updated drivers from Microsoft and HP.

Before beginning, turn the computer over and look for a battery compartment door (service door). For 2015 platforms, the battery is considered removable but not accessible. See the battery section for how to remove/unplug the battery.

To perform a hard reset on a computer with a sealed or non removable battery, use the following steps:

1. Turn off the computer.
2. Remove the computer from any port replicator or docking station.
3. Disconnect all external connected peripheral devices such as USB storage devices, external displays, and printers.
4. Unplug the AC adapter from the computer.
5. Disconnect the battery.
6. Press and hold the power button for at least 15 seconds to drain residual power.
7. Reconnect the battery and plug the AC adapter back into the computer, but do not connect any of the peripheral devices.
8. Press the power button to turn on the computer.
9. If a startup menu appears, use the arrow keys to select **Start Windows Normally**, and then press the Enter key.
10. After reconnecting each of the peripheral devices, run Windows Update and HP Support Assistant to update all device drivers.

Clear CMOS

CMOS refers to the battery-powered, semiconductor chip located on computer's system board. Notebooks store low-level settings like the system time and hardware settings in CMOS. Sometimes it is necessary to clear CMOS, which requires removing and reinserting the 3V RTC battery for a short period of time (a few minutes before reinserting), in addition to removing the AC adapter and battery.

NOTE: Clearing the CMOS should only be performed for troubleshooting purposes. There is no reason to clear CMOS if the computer is working properly.

The notebook service door must be removed to access the CMOS battery. If the computer has a replaceable RTC battery, see the RTC battery replacement section for the battery removal/replacement.

9. Soft reset (Default Settings)

NOTE: Some company policies prohibit updates or changes. Check whether the computer has custom BIOS settings before taking action.

If your computer is having issues booting, has errors during boot, is running into issues after adding hardware, or you are having other abnormal system behaviors that cannot be resolved through any other methods (i.e., hard reset), it may be necessary to reset the system BIOS to default settings.

To load BIOS to default settings: Reboot the computer, and then press **F10** > **Main** > **Restore defaults**. For more information, see the BIOS F10 Setup technical white paper at http://support.hp.com, enter your computer model, and then go to **Manuals** > **White papers** > **HP PC BIOS F10 Setup Guide**.

10. Reseat cables and connections

NOTE: Before disassembling the computer to reseat cables and connections, always disconnect power and remove the battery or disconnect a non removable battery.

Many problems are caused by improper connections or loose connections due to abnormal movement and vibration. See Cable management on page 132 and Connector types on page 133 for suggested cable management practices when removing and installing components.

You can access and reseat connections for Customer Self-Repair (CSR) parts (see the “Removal and replacement procedures for Customer Self-Repair parts” chapter for details). Examples of reseating hardware include:

- Reseating the battery into the battery bay can resolve no-battery found and no-charging issues.
- Reseating memory modules can resolve memory error, no-boot, and blue screen issues.
- Reseating the hard drive can resolve a POST error 3F0 (no boot device) issue (see POST Error Messages and User Actions on page 123).
- Reseating the keyboard cable can resolve an unrecognized keys error.
- Reseating the wireless module and antenna cable can resolve a wireless connection issue.

For field replaceable units (FRUs), authorized service providers can try the following steps (for more information, see the ”Removal and replacement procedures for authorized service provider parts” chapter).

- Reseating the fan cable can fix POST error 90B (no fan detected) issue (see POST Error Messages and User Actions on page 123).
- Reseating the power cable can fix a no boot issue.
- Reseating the daughterboards (some models may have a power button board, VGA board, etc.) can resolve their functional issues.
- Reseating graphics cables and panel connectors can fix distorted/flickering video.
- Replacing thermal pads may resolve thermal power-down issue.

11. Test with minimum configuration

The factory-shipped computer (hardware configuration and preinstalled operating system image) is well tested and ready for use. Therefore, using the original factory hardware configuration and/or booting to operating system safe mode often resolves issues quickly.

- Disconnect any external USB storage, remove any discs in optical drives, remove the computer from a docking station, remove external video, etc.
- In addition to removing recently added components, the issue can be narrowed down further with a minimum configuration. For example, if HP PC Diagnostics reports a memory error, test one memory module at a time to isolate the defective module.
- If the computer does not successfully boot the operating system, booting to safe mode may help identify what may be causing the issue as described below.

Essential hardware configuration

NOTE: This step is to be used by authorized service providers only. HP will not honor the warranty for a system tested with the system board removed without the heat sink, fan, etc.

If none of the steps above resolve the issue, start the computer with essential hardware only. The purpose is to remove as much as hardware as possible while still maintaining the computer’s ability to turn on.

This essential configuration is often used to troubleshoot power-on related issues, such as no-boot, reboot, and freezing issues.

The essential hardware consists of the following:

- System board
- AC adapter (unplug nonremovable battery or remove battery)
- Processor (and heat sink/fan). (Processor may be integrated into the system board.)
- Memory (one verified working memory DIMM)
- Graphics card (if no VGA port is available on the system board). Platform may have both Intel integrated graphics and discrete graphics. Therefore, discrete graphics card may not be needed.
- External VGA monitor
- External USB keyboard
- External mouse

NOTE: After the service door is removed, disconnect all connections (internal keyboard, display, discrete GPU, hard drive/solid-state drive, daughterboards, etc.) to achieve the essential hardware configuration above. DO NOT disassemble the system board from its enclosure at this time.

Reverse the procedure above by reinstalling each piece of hardware removed, one piece at a time, and testing your computer after each installation. Since your computer works with only the essential hardware installed, those parts must be working properly. This means that one of the hardware components removed is causing the computer to not work properly. By installing each device back into the computer and testing each time, the failing hardware will eventually be identified.

Safe mode

A driver conflict often results in a blue screen error message. Therefore, booting in safe mode can resolve many issues in Windows because safe mode forces the computer to load a limited version of Windows which only contains essential files. Safe mode is useful for troubleshooting problems with programs and drivers that might not start correctly or that might prevent Windows from starting correctly.

If a problem does not reappear when you start in safe mode, eliminate the default settings and basic device drivers as possible causes. Refer to the links below for how to start your computer in safe mode:

- http://support.hp.com/us-en/document/c01835750
- http://support.hp.com/us-en/document/c03439317

12. Test with verified working configuration (hardware and/or operating system)

One troubleshooting technique that can quickly isolate an issue is using a verified working part while testing. A good example is to use an external keyboard, mouse, or VGA monitor when you have issues with an internal keyboard, TouchPad, or display. Testing with a verified working AC adapter can identify an error caused by a faulty one. Similarly, testing with a verified working operating system can determine bad behaviors of the current operating system. See Non HP diagnostics tools on page 67 for instructions about obtaining and using a Windows-To-Go USB.

NOTE: In some situations, more than one item may contribute to a problem.

13. Replace the system board

The system board may be replaced only by authorized service providers. This should not be considered an initial step taken to resolve an issue. Review and perform all steps discussed previously before replacing the system board. 4. Update BIOS and drivers on page 63, 7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68, 8. Hard reset on page 70, and 9. Soft reset (Default Settings) on page 71, and/or 10. Reseat cables and connections on page 72 can resolve many system board issues without requiring the effort of replacing unnecessary hardware.

Review Table 6-1 Troubleshooting methodology and general troubleshooting steps on page 59 for appropriate troubleshooting steps.

IMPORTANT: System board failure is not common. Do not replace the system board until you have tried all other troubleshooting options.

NOTE: Determine whether a previous service case might be related to the current problem. For example, a fan detection issue may be caused by a loose connection resulting from previous service.

TIP: Without an RTC battery (3V coin-cell battery), the computer automatically reboots. This is a useful feature when the power connector cable (between external AC adapter and system board) is defective.

NOTE: Most of the time, effective troubleshooting can prevent a system board replacement.

Items that may prevent resolution of the issue:

- The information provided about the issue omits key details, including any actions taken before the issue occurred.
- BIOS, software, and drivers have not been updated.
- Cables or connections are loose.
- Technician is unaware of information available from the HP Support website (i.e., CA - Customer Advisory).
- The issue is related to existing or known issues that may be identified in existing support articles.
- Technician may have omitted steps in the provided repair instructions (e.g., Spare Part Replacement Instructions).
- Skipping one of steps from Troubleshooting Methodology table results in No Defect Found (NDF)/No Fault Found (NFF)/No Issue Detected (NID) messages.

Verify solution

- Verify that the implemented solution works. Reboot the system or device and try to complete the task that produced the issue.
- If a part has been replaced, verify other basic functions. For example, GPU replacement requires keyboard removal. Therefore, it is good practice to verify all basic components to be sure that the solution is complete.
- Explain to the customer why the issue occurred and what was done to resolve it. If the solution you used was in an HP Public document, provide the document information to the customer, letting them know it can be located on www.hp.com. Also, tell them that there are other solutions available on the website. Advise the customer to check the website first when they have an issue. It may save them time calling in.
- Document the correct issue. Update the case with as many details as possible for other agents and engineering to analyze and study for lessons learned.

Helpful Hints

After you become familiar with the general troubleshooting steps above (General troubleshooting steps on page 59), follow the helpful hints below before running diagnostics and troubleshooting.

At startup

TIP: If you have installed an operating system other than the factory-installed operating system, go to http://www.hp.com/go/quickspecs and verify that it is supported on your system.

1. Be sure that the computer is plugged into a working AC outlet.
2. Be sure that power is connected to the docking station if a dock is used.
3. Be sure that the AC adapter light is on.
4. Be sure that the AC adapter is connected when you update BIOS to avoid BIOS corruption.
5. Be sure that the computer is turned on, the rear power light is solid white (connected to an external power source) and the front power light is solid white (normal operation).
6. Remove all optical and flash drives from your system before turning it on.
7. Be sure that the boot option is set to a working operating system drive.
8. Be sure that externally connected monitors are turned on and their power lights are on. Not all monitors are equipped with lights to indicate their functionality.
9. Turn up the brightness and contrast controls of a display or external display device if the screen is dim.

During operation

1. To wake the computer:
   a. Press the power button or any key on the keyboard.
   b. If the system remains in the Sleep (Windows), Suspend (Linux), or Hibernate state, shut down the system by pressing and holding the power button for at least four seconds.
   c. If the system does not shut down, unplug the power cord, wait a few seconds, and then plug it in again. Then press the power button again to restart the system. If it does not turn on, press the power button to start the computer.
2. Look for blinking lights on the computer. The blinking lights could be error codes that will help diagnose the problem.
3. Check all cables for loose or incorrect connections (external devices, power cords, dock, etc.).
4. After installing a non-Plug and Play expansion board or other option, reconfigure the computer. For example, if you upgrade to a solid-state drive, you may need to reconfigure the boot order.
5. Be sure that all required device drivers have been installed. For example, if you have connected a printer, you must install a printer driver.
6. If there is a network connection issue, plug another computer with a different cable into the network connection. There might be a problem with the network plug or cable.
7. If hardware has recently been installed, remove it and determine whether the computer functions properly.
8. If software has recently been installed, uninstall it and determine whether the computer functions properly.
9. If the screen is blank, confirm the display choice by pressing Windows logo ⊞ + P and set to screen only. Or plug an external monitor into a different video port on the computer if one is available and close the computer lid.
10. Verify that the latest version of BIOS, drivers, and software are installed. A new release might support new features or fix the problem.
11. Press the caps lock and/or num lock key. If the caps lock and/or num lock light toggles on or off, the keyboard is likely operating correctly.
12. Press the TouchPad On/Off button light. If the light toggles on or off, the TouchPad is likely operating correctly.

Consulting with HP Service

If further HP support is required, a lot of the following information may be requested when you call, so it may be helpful to take notes.

- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Product identification number
- Applicable error messages
- Add-on boards or hardware

- Third-party hardware or software
- Operating system type and revision level

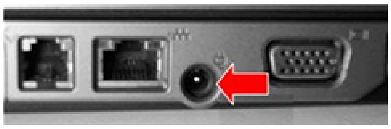
Common issues and possible solutions

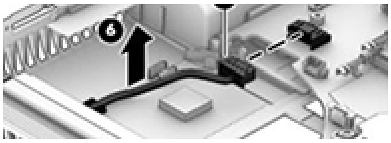
This section contains common issues, symptoms, and a series of tables that describe possible solutions to issues from *Failure classification* on page 60 tables. The following sections identify the issue with symptoms and solutions to resolve an issue.

Power-on issues

No Power

When a unit experiences no power there are several contributing factors to consider. Be sure to consider all symptoms related to this behavior in troubleshooting.

Items	Procedures
Symptoms ● Computer does not start ● Display is black or blank ● No fan noise ● No hard drive spinning ● Lights do not glow	*Possible causes* Failed power input to the computer (external power source, AC adapter, faulty battery). Bad connection to the computer (bad power button, power connector). Defective parts (memory, hard drive, graphics) or failed system board.
	Troubleshooting steps **Perform quick check** Remove all external devices, including docking station. Verify external power source (2. Examine the environment on page 62). Perform a hard reset (8. Hard reset on page 70).
 	**Verify AC adapter** It is preferable to verify the battery before verifying the AC adapter. However, you can verify the AC adapter first, before opening the service door for a battery check. ● Verify AC adapter is compatible with product. Verify that the part number is for this computer if possible. ● Verify AC adapter and power cord are good (no physical damage, bent middle ID pin). ● Verify AC adapter works on a verified working computer. ● Plug in AC adapter and power on computer without battery. ● Inspect power port on computer side for any damage, dust, or debris. ● Check power light (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68). Rear power light indicates external power to the computer is good.
NOTE: Refer to battery replacement section for removing/replacing the battery	**Verify battery condition/status** 1. Check battery condition (overall result, cycle life, voltage, etc.) using HP PC Hardware Diagnostics (UEFI) or HPSA tools.

Items	Procedures
	2. Verify that battery is installed properly in battery bay without a gap and that latch locks are tight (for models with removable batteries). 3. Check battery status light (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68). Be sure that battery is not fully discharged, preventing system from booting. 4. Determine whether the computer can turn on with battery only. 5. Remove service door and test with a verified working battery. If the computer boots, inspect original battery before replacement. 6. Test battery with a verified working computer to verify that it is OK. 7. If there is still no boot, remove battery and boot on AC power only.
The sections below are intended for authorized service providers/technicians.	
	Verify AC adapter – voltage 1. Measure DC voltage output that should be around 19.5 VDC and acceptable voltage range is from 18.5 – 20.5 VDC. 2. If the DC voltage is out of range, replace the AC adapter. NOTE: This action requires a digital voltmeter.
NOTE: Select models include a power cable between the system board and chassis power connector.  	**Verify power button, power connector** 1. Be sure that power button is not stuck. 2. Reseat power connector cable (if applicable). 3. Replace new power connector cable (if the cable exists and is defective) 4. To isolate faulty power connector cable and power button, technicians can short power-on pads/pins to power up the computer. Contact HP Engineering for this information.
	Verify blinking lights (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68) At this point, there should be sufficient power from the AC adapter to the system board. Expect to hear the fan spinning and see blinking lights or error messages (i.e., faulty memory, HDD, etc)
	Verify system board 1. Test essential hardware configuration (11. Test with minimum configuration on page 72, 12. Test with verified working configuration (hardware and/or operating system) on page 74, 13. Replace the system board on page 74) by removing nonessential parts. 2. If there is still no boot, replace system board.
Tips and tricks	Computer automatically boots without pressing power button when RTC 3V battery has been removed. Therefore, after the service door and RTC 3V battery are removed, no need to press power button from top side. In essential hardware configuration, mWS G1 and G2 may require discrete GPU to boot. However, mWS G3 can boot with integrated graphics.

Intermittent power-on, shutdown, reboot

Items	Procedures
Symptoms ● Does not always turn on ● Intermittently hangs ● Intermittently shuts down ● Spontaneously reboots	*Possible causes* Electrical short, fluctuating power source, unstable power rails, loose connections, bent pins, stray wires, dust, obvious damage, nearly faulty parts (bulging/leaking capacitor). Potentially will turn into a no power issue soon (No Power on page 77).
	Troubleshooting steps 1. Visually check power ports on both AC adapter and computer sides. 2. Inspect power sources: a. Verify AC adapter working correctly. Use a confirmed working adapter to test. b. Verify that battery is not depleted while system is in Sleep state. Test with a confirmed working battery.
The sections below are intended for authorized service providers/technicians.	
	1. Follow actions in No Power on page 77. a. Be sure that AC adapter has correct DC voltage. b. Verify battery - test with a confirmed working battery. c. Verify that power button is not stuck. d. Verify that power connector is not loose. e. Verify that Power Good LEDs are solid. f. Remedy loose connections and reseat major components (processor, memory, GPU, hard drive/solid-state drive, etc). 2. Perform visual check for loose connections, bent pins, stray wires, dust, nearly faulty parts (bulging/leaking capacitor). 3. Test **essential hardware configuration** (11. Test with minimum configuration on page 72) a. If system boots, reinstall nonessential hardware one component at a time to isolate issue. b. If system does not boot, replace essential hardware with verified working parts, one component at a time. If system still does not boot, replace system board.

AC adapter issue

	Solution
Symptoms - No sign of power - No boot - No rear power light - No front power light - Battery does not charge when AC adapter is connected	*Possible causes* AC adapter and others (i.e., external power source)
	Troubleshooting steps Quick check 1. Verify external power source (2. Examine the environment on page 62). 2. Remove all external devices, including docking station. 3. Perform a hard reset for the computer (8. Hard reset on page 70). 4. Disconnect and reassemble the power cord and adapter in case the adapter experienced short circuit, over current, over temperature events. 5. Use a verified working adapter. If the computer operates normally, there is a problem with the original adapter. 6. Verify that the AC adapter works on a verified working computer. If the computer operates normally, there is no problem with the adapter. See HP Smart Adapter warning message on page 96 for further information.
	Verify AC adapter 1. Remove working battery. 2. Verify that AC adapter is compatible with product. Verify that part number is for this computer if possible. 3. Inspect AC adapter and power cord for physical damage, bent middle ID pin. 4. Plug in AC adapter and power the computer without battery. 5. Inspect the power port on computer side for any damage, dust, debris. 6. Check power light (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68). Rear power light indicates that external power to the computer is good. 7. If there is still no rear power light or no boot, replace the AC adapter.
Tips and tricks	The HP Smart AC adapter has a special pin in the middle, called the ID pin, for power rating and throttling purpose. If this pin is broken, the rear power light will be on but the power button and front power lights will blink continuously and the computer will not turn on. Third party AC adapter will not work on the computer. Use the AC adapter that came with the computer for better performance.

Battery not recognized, not charging

Items	Procedures
Symptoms ● No battery status light ● Blinking amber (critically low battery level) ● No boot without AC adapter	*Possible causes* Defective AC adapter and/or battery. NOTE: Before proceeding, verify that the computer can boot to BIOS or Windows with a good AC adapter.
	Troubleshooting steps **Visual inspections** 1. Inspect battery connectors for any signs of damage. 2. Verify that battery is installed properly in battery bay without gap or obstructions and latch locks are tight. Reseat battery (for models with removable batteries). 3. Determine whether battery gets hot (batteries heat up when charging, but not too hot to touch). **Check battery warranty** to see whether the battery is new or its warranty is expired. Battery capacity degrades over time. **Verify front battery status light** 1. Battery status light is off: battery not recognized. 2. Battery status light is blinking amber: critically low battery level. **Reset** 1. Hard reset (8. Hard reset on page 70) 2. Soft reset (9. Soft reset (Default Settings) on page 71) **Verify AC adapter** 1. Determine whether the computer needs the AC adapter to boot and operate. Sometimes, intermittently bad AC adapter and loose connection between adapter and computer results in inability to charge battery which causes short run time. 2. Inspect AC adapter to verify that it is functioning. 3. Test with a working AC adapter and confirm whether battery is charging. 4. Be sure that battery is fully charged (AC adapter plugged in at least 2.5 hours). **Diagnostics:** HP tools will report results such as passed, calibrate, weak, replace, no battery and unknown, and suggest corresponding actions. **Use HP Hardware Diagnostics (UEFI)** (6. HP Hardware Diagnostics and Tools on page 64) ● HP PC Hardware Diagnostics (UEFI) is a good tool to use to isolate and determine faulty battery, especially for quickly discharging (short life) battery. **Use HP Support Assistant tools in Windows** (HP Support Assistant (HPSA) on page 66) 1. Verify that battery is recognized and charging. 2. Verify battery condition if battery cycle life is over specs (i.e., long life of 1000-cycle life and 3-year warranty). Battery may have premature capacity loss within its cycle life or warranty.

Items	Procedures
	3. If issue remains, test with a verified working battery and verify battery status lights and battery conditions. 4. If issue remains, replace system board. 5. Verify the new replacement.
Tips and tricks	See the computer user guide for instructions regarding battery maintenance and increasing battery life. Also reference http://support.hp.com/us-en/document/c01297640?jumpid=hpr_r1002_usen_link3.

Battery discharges too fast

Items	Procedures
Symptoms Battery has good status light but discharges too fast	*Possible causes* AC adapter and/or battery.
	Troubleshooting steps **Verify AC adapter** Determine whether the computer needs the AC adapter to boot and operate. Sometimes, intermittently bad AC adapter and loose connection between adapter and computer results in inability to charge battery and causes short run time. 1. Inspect AC adapter to verify that it is working. 2. Test with AC adapter alone and with a verified working AC adapter.
	Verify battery: Battery capacity can degrade over time, so check the warranty coverage. Run a battery test to confirm if issue is hardware-related. 1. Review battery power plans in **Control Panel** > **Power Options** that may consume more energy and discharge battery faster. Resetting default to **Power Saver** option can conserve battery power. 2. Determine whether any graphics processing is running. 3. Verify battery maintenance and operations. Leaving the battery at a high level of charge in a high-temperature environment for extended periods accelerates the loss of capacity. 4. Test and calibrate battery using HP PC Hardware Diagnostics (UEFI). 5. Verify battery life cycle using HP Support Assistant tool. If battery cycle life is over specs (long life battery of 1000-cycle life and 3-year warranty), battery may have capacity loss beyond its lifecycle or warranty. 6. Compare discharge time with a verified working battery (remove AC adapter) using **Hardware Diagnostics (UEFI)** > **Hard Drive Tests** > **Extensive Test** > **Loop until error**.
Tips and tricks	To conserve battery power, turn off Wireless On-Off button and other peripherals/USB devices, applications, processes (in Task Manager) when not in use; also, reduce screen brightness. Follow HP instructions of how to maintain battery and increase battery life. Also reference http://support.hp.com/us-en/document/c01297640?jumpid=hpr_r1002_usen_link3.

Burnt smell

Items	Procedures
Symptoms Emits smoke, burnt smell	*Possible causes* Defective on-board components.
	Troubleshooting steps General visual inspection 1. Disconnect the computer from power source (AC adapter and battery). 2. Inspect for visual damage on AC adapter and battery. Test on a known working computer to isolate issue. If issue follows AC adapter or battery, replace it. 3. Inspect any sign of liquid spill on the computer (back of keyboard).
The sections below are intended for authorized service providers/technicians.	
	Further inspection on components 1. Inspect further sources internally after disassembling chassis, such as burnt or damaged components. 2. If the issue persists, replace boards, AC adapter, and battery for safety concern and report issues to HP.

POST

No video (with power)

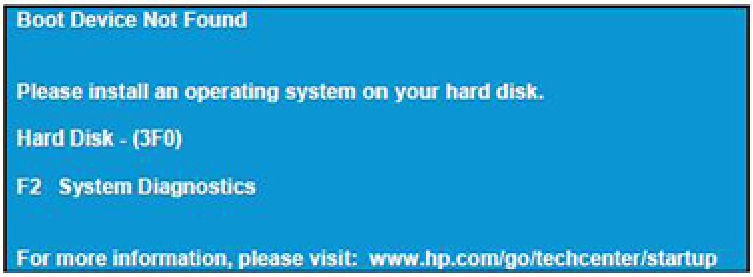
Items	Procedures
Symptoms	*Possible causes*
- No video (black/blank image) but have power	Failed display
- Light activity	Failed critical components (memory, hard drive, system board)
- No error messages	Loose connection
- Fan noise	Recently added hardware
- Hard drive light blinking and hard drive noise	NOTE: Assume the computer has not previously been set up for multiple displays.
	Troubleshooting steps Quick check 1. Verify that system light activity is OK. 2. Remove all external devices, including docking station. Recently added hardware and/or applications may cause graphics driver conflict and result in loss of video. 3. Perform hardware reset (8. Hard reset on page 70) and verify that HP Logo is presented correctly on display screen when pressing F10. 4. Test with external monitor via VGA port (or DisplayPort, HDMI, etc). Press power button and close the computer lid to force video output to external video. If unsuccessful, contact HP service. 5. If external video is OK, update BIOS, software, and drivers (4. Update BIOS and drivers on page 63) and perform soft reset (9. Soft reset (Default Settings) on page 71) if needed. Go to next step to verify display.
	Verify display - When booting to Windows, determine whether image appears on display screen (via Windows Screen Solutions or Windows logo ⊞ + P for display switcher). - If there is video on display, disconnect external display device, open the computer lid and restart.
The sections below are intended for authorized service providers/technicians.	
	1. Verify Power Good lights are on to be sure that system board power is functional. 2. Reseat display cable connection on system board. 3. Reseat display cable connection on display panel side. 4. Examine and reseat major components, such as hard drive, memory. 5. Test with minimum configuration (11. Test with minimum configuration on page 72) by removing hard drive to isolate operating system issues and testing video in F10 Setup. 6. If video is present, restart and retest the computer. 7. If video is present but bad, go to Display on page 97 section. 8. If issue persists (no video), test with external video.

Items	Procedures
	9. If issue persists, test or replace a confirmed working display. 10. If issue persists, replace discrete graphics card. 11. If issue persists, replace system board due to defective video function.
Tips and tricks	Swipe a metal piece (screwdriver) over wireless/mute buttons to act as if closing lid to force video output to external display device. See the “External component identification – Display” section for location of the magnetic sensor.

Blinking lights

Items	Procedures
Symptoms Lights blink on keyboard caps lock/num lock keys	*Possible causes* Blinking lights on startup usually indicate a problem with basic functionality of a critical component (processor, BIOS, graphics cards, memory, etc.) due to loose connection, defective parts, or recently added parts.
	Troubleshooting steps 1. Check for any blink patterns. Count the number of blinks in a sequence, followed by a pause for a few seconds. 2. See Status, Blinking Lights, and Error Message (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68) for corrective actions. 3. If internal hardware components (memory, hard drive, etc.) have been recently added, a component may not be connected properly. Remove and reseat new components (10. Reseat cables and connections on page 72) one at a time.
Note	Since the display may not be functional, lights are used to indicate an error.

Diagnostics error messages

Items	Procedures
Symptoms • Computer has power • POST error message displays (Windows logo has not yet appeared)	*Possible causes* Diagnostic error messages indicate a problem. There may be a problem with the instruction being sent from the BIOS to a hardware component (e.g., keyboard failures), or incompatible hardware. Can usually be resolved by installing updated firmware for the component.
	Troubleshooting steps 1. See 7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68 for corrective actions. An example of a POST error message is shown below.  Boot Device Not Found Please install an operating system on your hard disk. Hard Disk - (3F0) F2 System Diagnostics For more information, please visit: www.hp.com/go/techcenter/startup 2. If there is power, you may be able to access BIOS. Reset BIOS to its default condition. (9. Soft reset (Default Settings) on page 71) 3. Restore hardware to its original condition (i.e., bootable solid-state drive instead of hard drive). 4. Reseat suspected components and verify connection. 5. Test suspected components using HP PC Hardware Diagnostics (UEFI) tool.
Note	An Error Message means the system has finished BIOS hardware validation and is ready to launch the **Startup Menu**. To access the **Startup Menu** for further options, press the Esc key while restarting the computer.

BIOS password

Items	Procedures
Symptoms	*Possible causes*
Some sections are unavailable (grayed out)	BIOS administration password is required.
	Troubleshooting steps 1. Review F10 BIOS Setup Overview to determine which features must be enabled. 2. Your BIOS settings may be managed by a BIOS administrator password setup. 3. If you lost or forgot user password, contact your IT personnel. 4. If you lost or forgot administrator password, contact HP service to reset the password. This process requires a unique UUID.
Reference	HP F10 Setup Overview http://h10032.www1.hp.com/ctg/Manual/c04460979 http://h10032.www1.hp.com/ctg/Manual/c04685655 2015 Business PC models – see the BIOS F10 Setup technical white paper at http://support.hp.com, enter your computer model, and then go to **Manuals** > **White papers** > **HP PC BIOS F10 Setup Guide**.

Performance (OS)

NOTE: Most software problems occur as a result of the following:

- The application was not installed or configured correctly.
- There is insufficient memory available to run the application.
- There is a conflict between applications.

Make sure that all the needed device drivers are installed.

If an operating system other than the factory operating system is installed, check whether the operating system is supported and the application is certified for the version of the operating system.

HP ships and supports Windows 7 with BIOS Legacy boot mode and Windows 8, 10 with BIOS UEFI boot mode. Therefore, HP recommends that you switch BIOS boot mode from Legacy to UEFI Native for clean Windows 8, 10 installations, or to UEFI Hybrid (if available) for upgrading the option from Windows 7 to Windows 8, 10. UEFI Windows 8, 10 avoids many unexpected behaviors (i.e., blue screen error, graphics/video issues) in the BIOS Legacy setting.

Intermittent shutdown

Items	Procedures
Symptoms ● Shutdown during startup ● Shutdown during operation	*Possible causes* It is often difficult to troubleshoot an intermittent issue. Possible causes include the following: Power-related issue: defective or insufficient power sources, poor connection. OS Custom Setting: Energy Saver (Power Management). Thermal-related issue: thermal sensors reach limits. Hardware related issue: voltage, out-of-range current; electrical short.
	Troubleshooting steps 1. Update BIOS and drivers. (4. Update BIOS and drivers on page 63) 2. Perform hard reset (8. Hard reset on page 70) 3. Perform soft reset (9. Soft reset (Default Settings) on page 71)
	Power related issue 1. Verify functionality of AC adapter alone. If no functionality, test with a verified working adapter. 2. Verify battery alone. Verify that battery is not depleted. Test battery using HP PC Hardware Diagnostics (UEFI) tool. 3. Verify connection of power button, power cable.
	OS custom settings 1. Advise users to reset power options and close all applications that are not in use, including applications in the background. 2. Test with a confirmed working operating system to isolate custom settings by users or any conflicting applications that cause shutdown.
The sections below are intended for authorized service providers/technicians.	
	Thermal-related issue 1. Verify thermal condition: a. Test fan using HP PC Hardware Diagnostics (UEFI) tool (6. HP Hardware Diagnostics and Tools on page 64) b. Check fan and connection. Reseat fan cable. c. Be sure that no obstructions or dust are in heat sink fan, fin, or vent. d. Test with a verified working fan. e. Remove old thermal compound and pads and replace with new compound and pads. 2. Verify thermal solution: ○ Use Thermal Monitor tool (available only to authorized service providers/technicians) to perform stress test (processor and GPU) (6. HP Hardware Diagnostics and Tools on page 64) and verify that thermal sensors are within limits after thermal condition is serviced.
	Hardware related issue 1. Check for any signs of loose connections, bent pins, stray wires, dust, nearly faulty parts (bulging/leaking capacitor).

Items	Procedures
	2. Verify that lights are solid. 3. If shutdown is reproducible, test essential hardware configuration: a. If no issue with hardware configuration, reinstall one non essential component at a time to determine faulty hardware. b. If issue persists, replace essential hardware with a confirmed working part, one at a time. If no boot, replace system board.
Tips and tricks	Intermittent issue is difficult to reproduce and troubleshoot. It is important to record details on shutdown frequencies, system configuration (3D video application) and operating conditions.

Blue screen

Items	Procedures
Symptoms - Have power, light activity, fan spinning - HP Logo displays briefly - Fails to boot into Windows operating system, displays blue screen, and then crashes, restarts, or stops responding	*Possible causes* Recent changes: conflict of instructions from multiple programs or just added hardware. Incompatible hardware and driver. Poor connection (hard drive, memory). Hardware malfunctioning due to overheating (GPU, processor). Defective hardware (memory, hard drive).
Important Notes & Resources	*Troubleshooting steps* There are many different ways to troubleshoot a blue screen error. Therefore, you need to identify working configuration (Windows 7/8/10) and specific symptoms of the failure in order to narrow down the issue. Refer to Blue screen (BSOD) error on page 114.
	Recommended resources Microsoft knowledge base: http://windows.microsoft.com/en-us/windows-8/resolve-windows-blue-screen-errors For more information search for HP Troubleshooting Error Messages on a blue screen at http://www.hp.com.

Overview of General Troubleshooting Steps for a blue screen error

1. Note the blue screen error message and what activity was performed at the time.
2. Perform a hard reset (8. Hard reset on page 70) after disconnecting all external peripherals.
3. Reset BIOS to default (9. Soft reset (Default Settings) on page 71) to prevent booting to another device.
4. Run HP Hardware Diagnostics (6. HP Hardware Diagnostics and Tools on page 64) to isolate major faulty hardware issues.

  - HP PC Hardware Diagnostics (UEFI) tool to test hard drive, memory and system.
  - Thermal Monitor (available only to authorized service providers/technicians) tool to monitor temperature limits of processor and GPU. See “HP Thermal Monitor” in 6. HP Hardware Diagnostics and Tools on page 64.

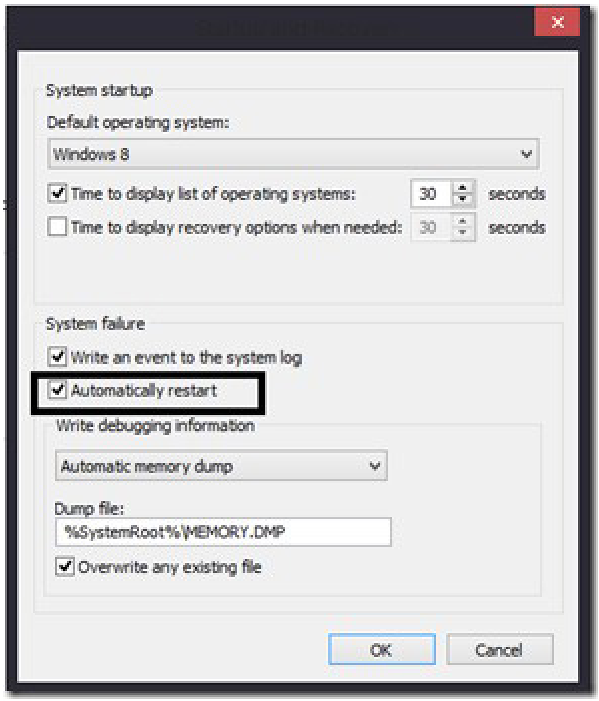
5. Remove or undo recently added hardware (5. Remove or uninstall recently added hardware, software on page 63). For example, incompatible memory or new solid-state drive storage.
6. Reseat cables and connections (10. Reseat cables and connections on page 72). Pay attention to proper installation of memory and hard drive.
7. Verify that a minimum of at least 100 MB of free space is available on your Windows partition.
8. If you can start Windows:
   a. Update BIOS and drivers (4. Update BIOS and drivers on page 63) to support updates for incompatibilities.
   b. Get all the latest updates, using Windows Update.
   c. Undo recent changes:
      - Startup using Last Known Good Configuration.
      - Use System Restore.
      - Roll back device driver in Device Manager.
   d. Check for specific Error Message. See Common Blue Screen Error Messages on page 125.
   e. Boot to safe mode (11. Test with minimum configuration on page 72) to troubleshoot issues.
9. If you cannot start Windows:
   a. Boot to safe mode. (11. Test with minimum configuration on page 72)
   b. Use Startup Repair to fix Windows startup files.
   c. Undo recent changes using System Restore to revert to a previous “working” state.
   d. Check for specific STOP error by analyzing Crash Dump (retrieved via a bootable USB). See Use Windows Debugging Tool on page 126.
   e. Restore computer using System Recovery or image backup to factory settings.
10. Lastly, test with essential hardware configuration (11. Test with minimum configuration on page 72) along with a verified working operating system (i.e., USB Windows-To-Go), if available, to isolate the software issue.

Tips & tricks

In some cases, the computer may reboot automatically before you have time to read the blue screen.

To identify the error message itself, disable the automatic restart using one of the following methods:

Right-click on **My Computer**, and then select **Properties** > **Advanced**. Under **Startup and Recovery**, select **Settings**. Clear the **Automatically Restart** check box.



System startup

Default operating system:

Windows 8

☑ Time to display list of operating systems: 30 seconds

☐ Time to display recovery options when needed: 30 seconds

System failure

☑ Write an event to the system log

☑ Automatically restart

Write debugging information

Automatic memory dump

Dump file:

%SystemRoot%\MEMORY.DMP

☑ Overwrite any existing file

Windows Advanced Boot Option

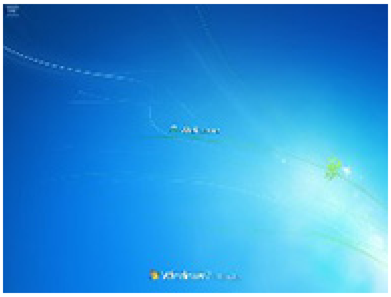
Windows 7:

1. Press F8 to open the Windows Advanced Boot Option screen.
2. Select **Disable automatic restart on system failure** to view error messages.

Windows 8:

1. Press F11 (System Recovery) to open the Windows Advanced Boot Option screen.
2. Select **Startup Settings** to view error messages.

Freeze at Windows Logo (hang/lockup)

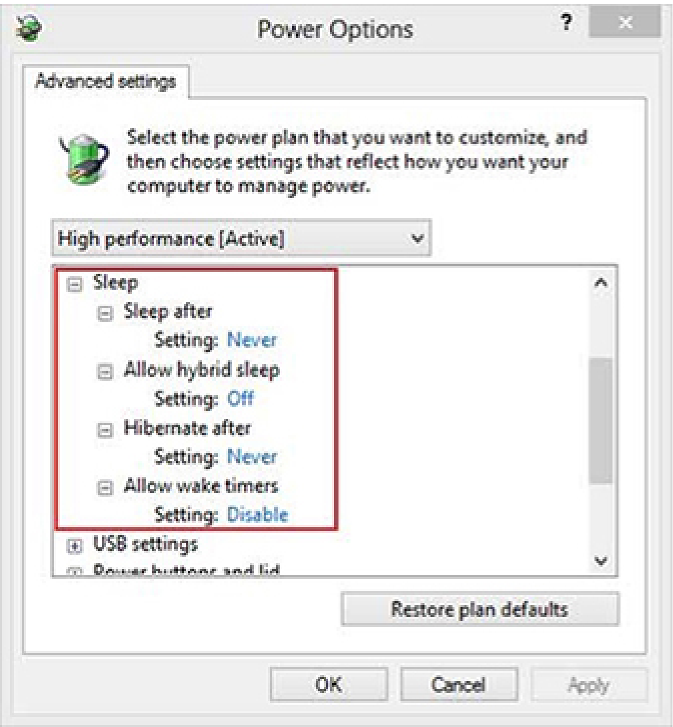
Items	Procedures
Symptoms ● Has power, light activity, fan spinning ● HP Logo displays briefly ● Attempt to boot to operating system and freeze/hang at Windows logo ● No response to pressing num lock or caps lock key 	*Possible causes* Conflict of instructions from multiple programs or drivers; installing a new hardware or program that is not compatible (may also cause a blue screen error—see blue screen issue).
	Troubleshooting steps Follow suggested steps below one at a time to verify normal boot process: 1. Disconnect all external peripherals, and perform a hard reset (8. Hard reset on page 70). 2. Perform soft reset (9. Soft reset (Default Settings) on page 71). 3. Update BIOS and drivers (4. Update BIOS and drivers on page 63). a. Roll back to previous version may be necessary. b. Go to safe mode to install drivers. 4. Run Hardware Diagnostics (6. HP Hardware Diagnostics and Tools on page 64) to isolate hardware issue. 5. Undo recent changes in Windows (5. Remove or uninstall recently added hardware, software on page 63). 6. Reseat cables and connections (10. Reseat cables and connections on page 72). 7. Start Windows in safe mode (11. Test with minimum configuration on page 72). 8. Use Startup Repair Windows to fix Windows damaged files. 9. Test with essential hardware configuration (11. Test with minimum configuration on page 72) along with a verified working operating system (i.e., USB Windows-To-Go) if available to isolate the software issue.
Tips and tricks	For more information, see http://support.hp.com/us-en/document/c03671001.

Electromagnetic Interference (EMI)

Items	Procedures
Symptoms	*Possible causes*
System locks up, freezes in certain physical area or location	Electromagnetic interference (EMI).
	Troubleshooting steps 1. See (2. Examine the environment on page 62). Pay attention to external power source, high-frequency signals such as cell phones, microwave ovens. 2. Move the computer to different locations nearby to determine where it fails and where it does not fail. 3. Test with a verified working computer in original factory configuration. 4. Consult with support.

No wake up

Items	Procedures
Symptoms	*Possible causes*
When resuming from a power management state the computer may display: - Blank screen - Some light activity	Power-saving mode; multiple-display setting.
	Troubleshooting steps 1. Verify that front power light (7. Status lights, blinking light codes, troubleshooting lights, and POST error messages on page 68) is blinking (indicating Sleep state). Press power button to exit Sleep. 2. Reset BIOS to default (associated with **OS Power Management** in **Power Menu**) (4. Update BIOS and drivers on page 63) 3. Verify power management settings in Windows **Power Options**. Disable Sleep options if the issue is resolved.

Items	Procedures
	 Power Options Advanced settings Restore plan defaults OK Cancel ApplySelect the power plan that you want to customize, and then choose settings that reflect how you want your computer to manage power. High performance [Active] Sleep Sleep after Setting: Never Allow hybrid sleep Setting: Off Hibernate after Setting: Never Allow wake timers Setting: Disable USB settings Power buttons and lid 4. Screen saver is set. Press any key or touch TouchPad to resume. 5. Verify that Display Choice is set to external video only. Toggle screen control key combination Fn + F4 or Windows logo +P.
Tips and tricks	If you are using a docking station, set your notebook display as a primary display. When the computer is undocked, you may think it is in a power-saving state, but the screen image may actually display on an external display device in the docking configuration.

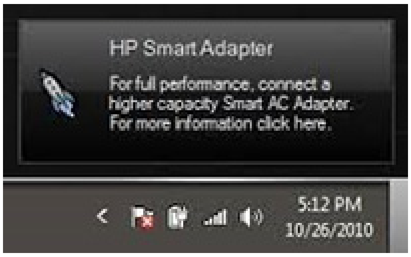
Unresponsive

Items	Procedures
Symptom Unresponsive	*Possible causes* Program in use has stopped responding to commands.
	Troubleshooting steps 1. If possible, use the Windows Task Manager to isolate and terminate the offending process. 2. Attempt the normal Windows shutdown procedure. 3. Restart the computer using the power button.

Slow performance

Items	Procedures
Symptom Slow performance when performing small tasks, or even in idle mode	*Possible causes* Processor is hot or hard drive is full.
	Troubleshooting steps Processor is hot 1. Verify that airflow to the computer is not blocked. 2. Verify that chassis fans are connected and working properly. Some fans operate only when needed. 3. Verify that the processor heat sink is installed properly.
	Hard drive is full 1. Transfer data from the hard drive to create more space on the hard drive. Microsoft recommends at least 200 MB to sync system files. 2. Perform disk defragmentation to consolidate fragmented data on the hard drive so it will work more efficiently. Also see Slow performance on page 113.
Tips and tricks	See Routine Maintenance for Performance Improvement on page 125). See http://windows.microsoft.com/en-us/windows-8/free-up-disk-space. See http://windows.microsoft.com/en-us/windows/optimize-windows-better-performance#optimize-windows-better-performance=windows-vista.

HP Smart Adapter warning message

Items	Procedures
Symptom	*Possible causes*
Warning message displayed in Window	Less powerful AC adapter, BIOS out of date.
 HP Smart Adapter For full performance, connect a higher capacity Smart AC Adapter. For more information click here. 5:12 PM 10/26/2010	
	Troubleshooting steps 1. Update BIOS that may contain a table that assigns an appropriate adapter for a certain configuration. 2. Update the latest **HP Hotkey Support** software from Drivers website. 3. Verify sufficient power source (where adapter is connected). 4. Use appropriate AC adapter (often supplied with system) for optimum system performance. 5. Test with a verified working AC adapter. 6. Test the adapter on a verified working computer. 7. Contact HP for configuration details.
Note	**HP Smart AC adapter warning message:** informs you that as power demands increase, the notebook may not perform at full capacity, which may result in longer battery-charging time. In cases of extreme power demands, the system may also throttle back the processor, or with systems that have a discrete video sub-system, a video balance mode may occur to further balance the power needs of the system. System processor functions always have priority over battery charging, so charging delays will occur first.

Incorrect time and date

Item	Procedure
Symptom Incorrect date and time	*Possible cause* Real-time clock (RTC) battery might need replacement.
	Troubleshooting steps 1. Reset the date and time in the operating system Control Panel. 2. Replace the RTC battery. 3. Verify that date and time are correct.

Display

Display anomalies

The display panel is a field replaceable unit (FRU) and must be replaced by only authorized technicians. However, HP highly recommends that users and technicians observe specific symptom vs. generic symptoms and utilize the HP PC Hardware Diagnostics (UEFI) tool before any replacement.

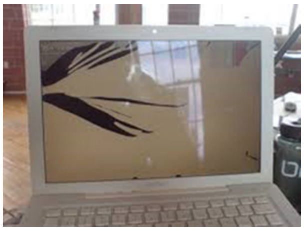
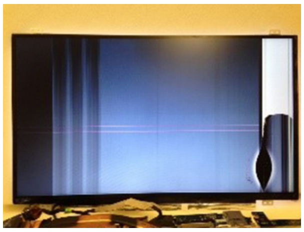
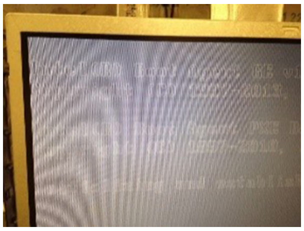
Symptom

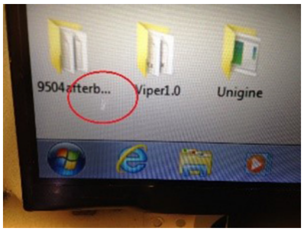
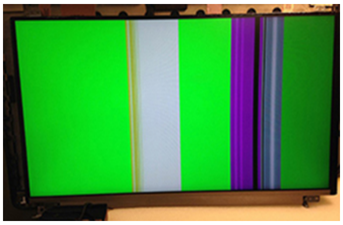
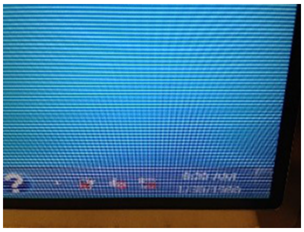
Common display issues with symptoms:

- Blank/black video
- Incorrect/missing color/distorted image
- Flickering image
- Vertical lines (due to LDVS, decreased signal integrity, and data loss)
- Dead pixel (due to display liquid, internal transistor, etc.)
- Horizontal lines (due to video memory)
- Distorted when hot (due to thermal issue)
- Cracked screen/image (physical damage)
- Light leakage/bleeding

  Contact support for assistance.
- Humming noise (due to frequency settings)

  Contact support for assistance.

Display anomalies		
		

Display anomalies		
Cracked screen	Cracked image	Blurred image
		
Dead pixel	Vertical lines	Horizontal lines

Quick check

- Visually examine the display for cracked screen, liquid crystal leak, dirty spots on glass, etc.
- Reset and update BIOS and docking firmware.
- Update operating system (OS), graphics/video drivers (Intel/AMD/NVidia, etc).

  For custom images, HP highly recommends upgrading or installing Windows in UEFI mode (or Legacy disabled) to fully support hybrid graphics and avoid unexpected behaviors (i.e., blue screen error, graphics/video issues) in the BIOS Legacy setting.
- Configure Windows settings (Power options, Screen brightness, Personalization, Screen resolution, etc.).
- Test with a verified working external display.
- Boot to Windows in safe mode.
- Test with a verified working operating system (i.e., shipping image).

HP PC Hardware Diagnostics (UEFI) for video test

Use this tool to quickly determine if the display issue is related to a real hardware issue.

To start HP PC Hardware Diagnostics (UEFI) (6. HP Hardware Diagnostics and Tools on page 64), when the computer is at boot, press the F2 key, select **Component Tests**, and then select **Video**.

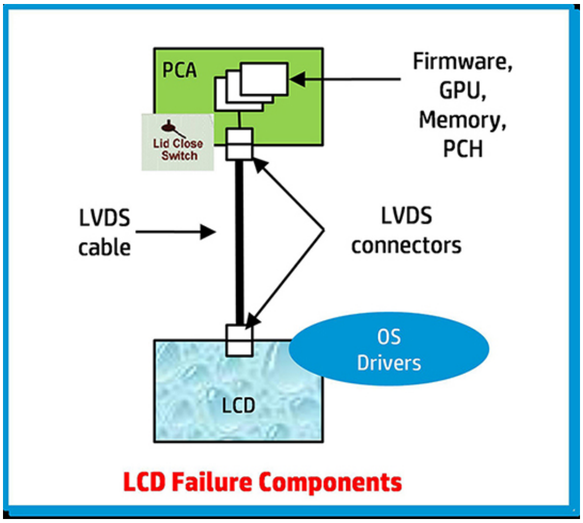
There are three options:

- **Video Memory Check**: to test video memory
- **Palette Check**: to test the three video color components (red, green, blue)
- **Dead Pixel Check:** to check dead pixels in eight different colors (Dead Pixel Check is available with the “HP PC Diagnostics 3-in-1 USB Key” tool)

Review the video troubleshooting in the Display section below for specific issues and possible solutions. For additional information about display problems, refer to documentation provided by the product manufacturer.

Display assembly diagram

The display assembly diagram shows basic video components: system board, graphics cards, display cables, display connectors, operating system (OS), graphics driver, and LCD display panel. Any component or a combination of these components can contribute to a video issue.



NOTE: The lid close switch is a Hall-effect sensor located in the top cover. When the display is closed, the sensor acts like a switch is closed. A notebook can force a video output to an external monitor, or go to hibernation or standby mode through power management. If the display screen does not light up when the display is open, the lid close switch (Hall-effect sensor) could be faulty.

Dead pixel

Display panel may show one or more pixels that are not properly lit when displaying a single color over the screen area. Use HP PC Hardware Diagnostics (UEFI) tool to determine those defective pixels. There is no solution for dead pixels. Refer to Display Issue: Pixel Anomalies on page 131 for the HP dead pixel policy.

No video (internal)

Items	Procedures
Symptoms	*Possible causes*
No internal video with certain programs (i.e., video-intensive games)	Display resolution, brightness, faulty lid switch, running a program requiring a higher resolution than the display screen can support. Faulty lid switch may put the system into Sleep or Hibernation mode.
	Troubleshooting steps
	Use an external monitor with higher resolution. Test with external monitor using HDMI or HP port. Press the power button and close the computer lid to force video output to external video. If there is still no video, contact support.
References	See section No video (with power) on page 84 for display information.

No video (external)

Items	Procedures
Symptom	*Possible causes*
No image on external monitor	External monitor, resolution, display configuration, drivers.
	Troubleshooting steps 1. Be sure external monitor is compatible with the computer. 2. Be sure that external monitor is turned on. 3. Press any key to get out power saving mode. 4. Adjust the brightness of the monitor. 5. Test with a verified working monitor. 6. Test the monitor via internal ports (VGA, DP ports). 7. Install latest video driver. 8. Reset the screen resolution as described in the documentation. 9. Configure display choice, and then force output to external video by closing the notebook lid or pressing Fn + F4 to switch screen output.

DisplayPort/VGA

See No video (external) on page 100.

HDMI

Items	Procedures
Symptoms - Display issue - Sound issue	*Possible causes* Cable, connection, settings.
	Troubleshooting steps Quick Check 1. Verify HDMI device input source is set correctly (i.e., HDMI1). 2. Be sure you are using the correct HDMI cable. 3. Check connection and reconnect the HDMI cable. 4. Verify if sound output is configured correctly in **Control Panel** > **Sound Manager**.
	1. Perform hard reset (4. Update BIOS and drivers on page 63). 2. Update BIOS and drivers (4. Update BIOS and drivers on page 63) when sound is heard but no video on HDTV.
References	http://support.hp.com/us-en/document/c01186408

No or bad external video via docking

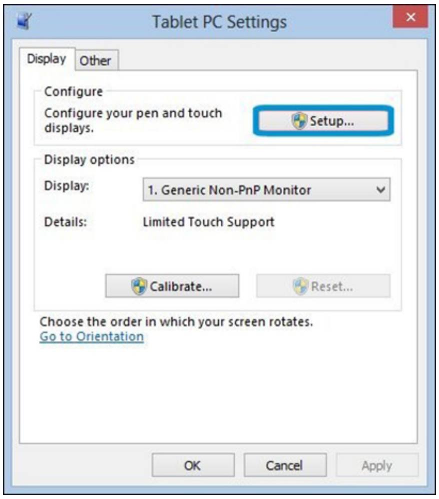
Items	Procedures
Symptoms	*Possible causes*
No or bad image on external monitor via ports of docking station (VGA, DP, TB, display port, etc.)	Rooted from system board, software/drivers, dock connectors, docking station hardware/firmware, dock video ports (DP, VGA, etc).
	Troubleshooting steps 1. Be sure that external monitor is powered on. 2. Be sure that external monitor is compatible with the computer. 3. If applicable, plug the dock in different Type-C ports. For more information, see the technical white paper titled "HP ZBook 65/150/200 W Thunderbolt 3 Dock User Guide." Go to http://support.hp.com/, enter your model number, and then click **Manuals** > **Technical white papers**. 4. If the screen image is distorted, try a DP-to-VGA adapter. Connect the adapter to each DisplayPort and VGA port of the dock. 5. Test the monitor via internal ports (VGA, DP, HDMI, etc.). 6. Verify that dock connectors of the notebook and the dock are clean, without dust, debris (e.g., using air duster). 7. Ideally, use a verified working operating system/system connected to the dock to isolate the issue of the current operating system. 8. Ideally, use a verified working docking station to isolate the faulty dock. 9. Update latest dock firmware. Be sure to follow the installation instructions carefully. You may want to try a DP-to-VGA adapter if you have a distorted screen image. Connect the adapter to each DisplayPort of the dock. If you still cannot update the dock, attempt to update it on a confirmed working notebook before having the dock replaced.
Note	See the technical white paper titled "Multiple displays on HP ZBook Mobile Workstations" from HP platform support website. Go to http://support.hp.com/, enter your model number, and then click **Manuals** > **Technical white papers**.

Incorrect or missing color/distorted image

Items	Procedures
Symptoms	*Possible causes*
System works normally but the display shows: - Missing or strange color - Image distortion	Loose connection, display cable, display, graphics card.
	Troubleshooting steps **Verify with external monitor (i.e., VGA)** 1. Use combination Fn + F4 to enable output to external monitor. 2. Close the lid. If the external monitor also shows incorrect color, it is graphics card issue. Test with a verified working graphics card.
	Verify display cable and cable connection–Display disassembly is required. Be sure that external display cables are not pinched or damaged.

Items	Procedures
	Be sure that external display cables have good connection at both ends (system board and display panel). - If moving cables affects the image, it is display cable. Test with a confirmed working cable. - If moving cables does not affect the image, is display issue. Test with a confirmed working display

Touch screen

Items	Procedures
Symptoms	*Possible causes*
Unresponsive	Dirt and smudge, driver, touch display configuration, power management.
Inaccurate	*Troubleshooting steps* Quick check Turn off the computer, spray glass cleaner onto a soft, damp cloth, and gently wipe the screen to remove dirt and smudge. NOTE: Do not spray cleaner directly onto the screen.
Configure the touch display in **Control Panel > Tablet PC Settings**  Tablet PC Settings Display Other Configure Setup... Display options Calibrate... Reset... Go to Orientation OK Cancel Apply Configure your pen and touch displays. Display: 1. Generic Non-PnP Monitor Details: Limited Touch Support Choose the order in which your screen rotates.	1. Restart the computer. 2. Verify touch screen and graphics drivers. 3. Configure the touch display to identify the screen as a touch screen as shown in the image at left. 4. Calibrate the screen and reset if touch functionality is still not working correctly. 5. Perform diagnostic test in HP Hardware Diagnostics under **Component Tests > Touch Screen**. If the diagnostics tests pass but the touch screen still does not respond, continue following the steps. 6. Adjust the power management settings for your touch screen. If the touch screen stops working after waking from sleep, adjust the power management settings so that the touch screen device stays active while the computer is in sleep mode. 7. Perform Microsoft System Restore and restore to a time when the system was working. 8. Perform HP System Recovery if none of the above actions resolves the issue.
References	https://support.hp.com/us-en/document/c03488148

I/O devices

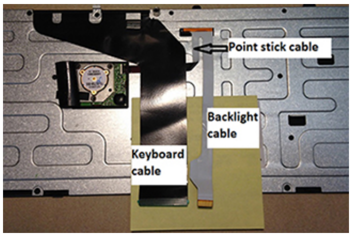
NOTE:

- Make sure external devices are supported and compliant (i.e., USB Type C, Thunderbolt 3, PCI Express, etc).
- If you have problems with external devices not provided by HP, contact device manufacturers for compatibility and latest drivers prior to troubleshooting (i.e., USB devices, Thunderbolt devices, PCI Express Card reader, VGA/Display/HDMI monitors, Speakers, etc).
- Be sure I/O devices are properly inserted into the I/O ports, and then be sure the I/O devices are recognized by Windows Device Manager.

Keyboard

Items	Procedures
Symptoms Keystrokes not recognized Characters not matched	*Possible causes* Dust trapped under keycap, loose keycap, loose keyboard connection, defective keyboard.
	Troubleshooting steps 1. Inspect the keyboard for any signs of dust, liquid, or debris trapped under sticky keys that might prevent keystroke recognition. 2. Check for incomplete connection between keyboard and system board by verifying that caps lock or num lock light turns on when key is pressed. 3. Verify whether the keyboard is recognized in Windows Device Manager and verify whether the keyboard driver is installed properly. 4. Test with a working external keyboard (i.e., USB keyboard). Also test in Windows for special keys (Caps Lock, Shift, Ctrl, Fn, Windows, Alt) if necessary. 5. Test with HP PC Hardware Diagnostics (UEFI) to isolate a hardware issue from a software issue. 6. Verify that BIOS is up to date. If so, resetting BIOS to default may help. 7. Test with verified working operating system or restore operating system to be sure that the issue is not caused by different language settings, sticky keys feature, etc. 8. Verify that keyboard flex cables are fully inserted and in good condition.
The sections below are intended for authorized service providers/technicians.	
	1. Verify if keyboard flex cable is in good condition (no delamination or torn cable end, no missing or cracked tracks, pads). 2. Verify keyboard flex cable ends are fully inserted and aligned with connectors on system board, and those connector tabs are properly closed. Reseat cables. 3. Replace new internal keyboard and retest.
Tips and tricks	A key only works when pressed with force. Inspect and remove debris trapped under keycap.

Keyboard point stick

Items	Procedures
Symptom Point stick not working properly	*Possible causes* Dust trapped under point stick, loose point stick cap.
	Troubleshooting steps 1. Inspect any signs of dust, liquid spill that prevent point stick from working. 2. Check whether point stick cap is loose and reseat it if necessary.
The sections below are intended for authorized service providers/technicians.	
 Example of back of keyboard, including keyboard, point stick, and backlight cables.	1. Verify whether keyboard flex cables are in good condition (no delamination or torn cable end, no missing or cracked tracks, pads). 2. Verify keyboard flex cable ends are fully inserted and aligned with connectors on system board and back of keyboard and that connector tabs are properly closed. 3. Reseat point stick cables.

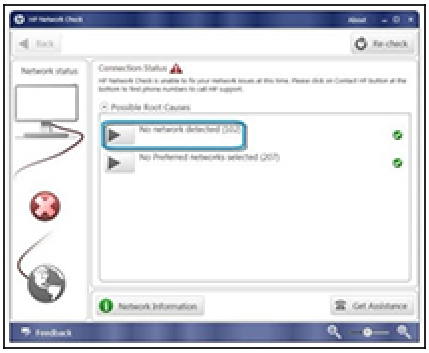
Keyboard backlight

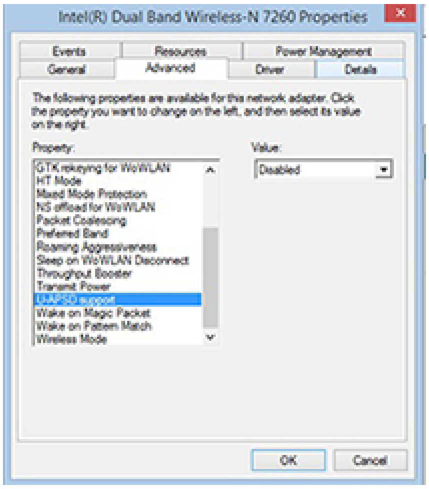
Items	Procedures
Symptom Backlight function not working properly	*Possible causes* Backlight disabled, loose connection.
	Troubleshooting steps NOTE: Not all notebook computers have backlit keyboards. A keyboard function key lets you turn the light on and off. Verify if backlit feature is not disabled by pressing a combination of Fn + Backlit key.
The sections below are intended for authorized service providers/technicians.	
	1. Verify if backlight flex cables are in good condition (no delamination or torn cable end, no missing or cracked tracks, pads). 2. Verify backlight flex cable ends are fully inserted and aligned with connectors on system board and that connector tabs are properly closed. 3. Reseat backlight cable.

TouchPad

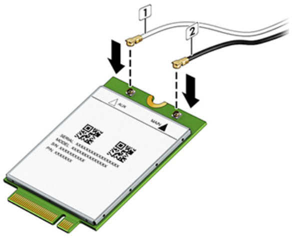
Items	Procedures
Symptoms Not working properly	*Possible causes* On/Off enabled, driver, settings.
(1) – TouchPad on/off button **(2)** – TouchPad	*Troubleshooting steps* 1. Ensure TouchPad On/Off light is not amber (disabled). Double touch to enable. 2. Verify if TouchPad device is listed in **Device Manager** > **Mice and other pointing devices**. 3. Install the latest TouchPad driver. 4. Adjust TouchPad settings (**Control Panel** > **Mouse**). 5. Test TouchPad controller using the HP PC Hardware Diagnostics (UEFI) tool (F2 > **Component Tests** > **Mouse Test** > **Pointer Test & Drag and Drop Test**).
The sections below are intended for authorized service providers/technicians.	
	1. Check the TouchPad cable for damage or a loose connection, and then reseat the TouchPad cable. 2. If issue persists, replace the TouchPad and verify the change.

Network connectivity wireless (WLAN)

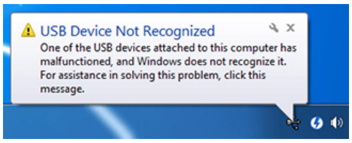
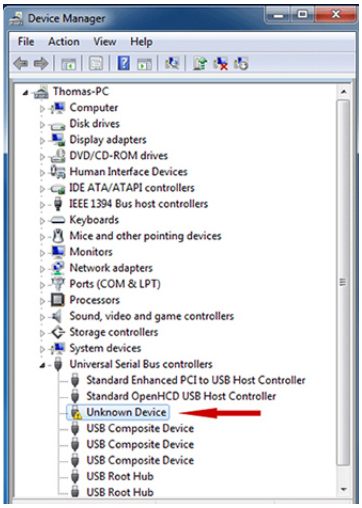
Items	Procedures
Symptoms - Unable to find networks (yellow bang) - Connection dropouts - Slow performance	*Possible causes* Network source, cable, connection, wireless module, driver, settings.
HP Support Assistant tool - No network detected in HPSA  HP Network Check Back Re-check Network status Connection Status Possible Root Causes No network detected No Preferred networks selected Network Information Get Assistance Feedback Wireless Adapter Properties - U-APSD support	*Troubleshooting steps* 1. Turn off the computer’s wired network (remove RJ-45 cable). 2. Examine environment for interference, such as cell phone or microwave, that may emit high frequencies (above 1 GHz). 3. Verify wireless source by moving computer closer to the wireless base/router. 4. Test with different wireless networks and check with your IT department for hardware compatibility, settings. 5. Verify that the wireless light is on. If the light is amber, press the wireless button to enable the wireless device. 6. Test with HP Support Assistant in Windows. 7. Diagnose with HP PC Hardware Diagnostics (UEFI) to isolate a hardware issue from a software issue. 8. **Update drivers:** Verify that wireless module is displayed in Device Manager and be sure that wireless drivers are up to date using www.hp.com or HP Support Assistant. If updating drivers does not help, try rolling back to previous drivers. 9. **Reset BIOS to Default:** If other devices can connect to your wireless network, but your computer cannot connect, a BIOS setting might be the cause of the problem. Restore BIOS to default.

Items	Procedures
 Intel(R) Dual Band Wireless-N 7260 Properties Events Resources Power Management General Advanced Driver Details OK Cancel The following properties are available for this network adapter. Click the property you want to change on the left, and then select its value on the right. Property: GTK rekeying for WoWLAN HT Mode Mixed Mode Protection NS offload for WoWLAN Packet Coalescing Preferred Band Roaming Aggressiveness Sleep on WoWLAN Disconnect Throughput Booster Transmit Power U-APSD support Wake on Magic Packet Wake on Pattern Match Wireless Mode Value: Disabled	10. Configure power management advanced settings as necessary. In the example to the left, **U-APSD support** (Unscheduled Automatic Power Save Delivery) is changed to **Disabled** to resolve an incompatible access point. If disabling U-APSD improves the throughput issue, check with the access point provider for updated firmware that resolves the issue. 11. Test with verified working operating system or perform operating system recovery to verify that the issue is not caused by customized settings. 12. Test with a verified working wireless module.
The sections below are intended for authorized service providers/technicians.	
	1. Verify that the wireless module and its antenna cables are fully inserted and in good condition (see WLAN module removal and replacement section). Reseat wireless module and antenna connection. 2. Verify module antenna cable connection are not loose. 3. Verify antenna cables are properly connected to the MAIN and AUX terminals (see WLAN module removal and replacement section).

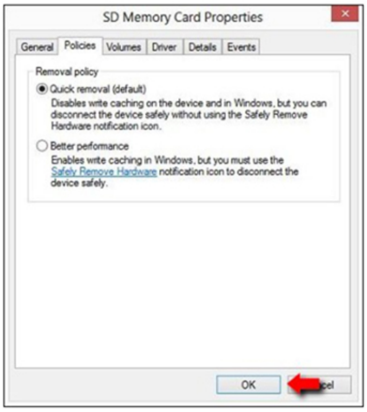
WWAN

Items	Procedures
Symptom Unable to find networks/service	*Possible causes* Network source, cable, connection, driver, settings.
	Troubleshooting steps 1. Update to the latest driver and utility. 2. Check with network service provider for signal coverage. 3. Make sure signal strength is good. 4. Make sure your service is active.
The sections below are intended for authorized service providers/technicians.	
 	● Verify module and antenna cable connections are not loose. ● Verify antenna cables are properly connected to the correct terminals. For example, the antenna cable labeled “1” connects to the “Main” terminal labeled “1”. The antenna cable labeled “2” connects to the “Aux” terminal labeled “2”.

USB

Items	Procedures
Symptoms • USB devices are not recognized • USB devices are not charging	*Possible causes* USB devices do not have the latest software drivers, port insufficient power, or not compliant. NOTE: USB Type-C uses a different connector entirely
Examples of USB device Not Recognized  USB Device Not Recognized One of the USB devices attached to this computer has malfunctioned, and Windows does not recognize it. For assistance in solving this problem, click this message.  Device Manager File Action View Help Thomas-PC Computer Disk drives Display adapters DVD/CD-ROM drives Human Interface Devices IDE ATA/ATAPI controllers IEEE 1394 Bus host controllers Keyboards Mice and other pointing devices Monitors Network adapters Ports (COM & LPT) Processors Sound, video and game controllers Storage controllers System devices Universal Serial Bus controllers Standard Enhanced PCI to USB Host Controller Standard OpenHCD USB Host Controller Unknown Device USB Composite Device USB Composite Device USB Composite Device USB Root Hub USB Root Hub	*Troubleshooting steps* 1. Unplug USB device and/or restart the computer (wait for 2-5 minutes) to reset USB port/hub in case of power surge. 2. Soft Reset (9. Soft reset (Default Settings) on page 71) and verify if USB device is recognized. 3. Verify if USB device is recognized in **Device Manager** > **Universal Serial Bus Controller**, or USB is recognized without Yellow bang. 4. Verify if the latest USB driver or/and USB chipset driver are installed. USB driver could be removed and reinstalled. 5. Make sure USB device is supported, for example, USB 3.0 device requires more power drawn (0.9A) from USB port than USB 2.0 device (0.5A). As a result, identify USB charging port to be used for charging a USB device, or an external AC power adapter may be required for an external USB storage to work properly. 6. Test with verified working USB devices (keyboard, mouse, USB key) to make sure USB ports are functional. 7. Test USB device on a verified working computer to make sure USB device is not malfunctioning.

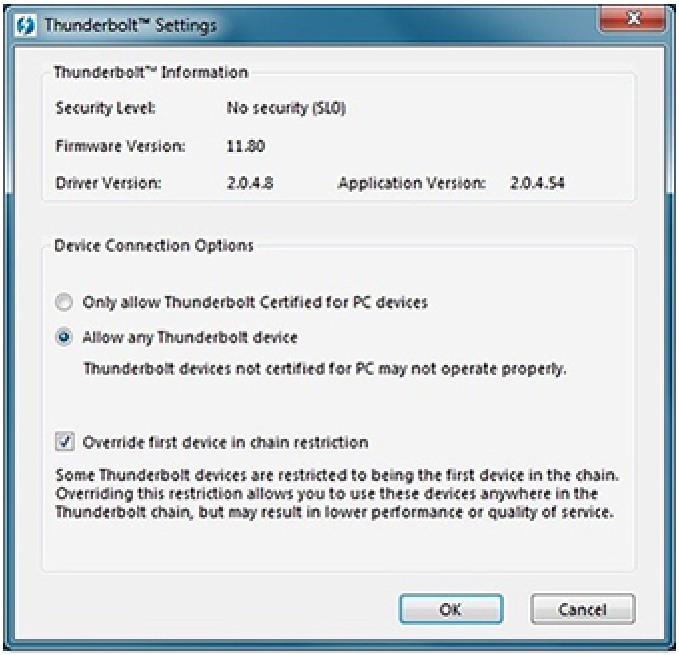
Smart card reader

Items	Procedures
Symptoms	*Possible causes*
• Not recognized	Physical damage, incorrect insertion, dirt, driver, malfunctioning card reader.
• Unable to write	NOTE: Some cards have a read/write security switch on the card. Make sure that switch is set to “write enabled” before attempting to write data to it.
Card Reader Removal Policy  SD Memory Card Properties General Policies Volumes Driver Details Events Removal policy ● Quick removal (default) Disables write caching on the device and in Windows, but you can disconnect the device safely without using the Safely Remove Hardware notification icon. ○ Better performance Enables write caching in Windows, but you must use the Safely Remove Hardware notification icon to disconnect the device safely. 	*Troubleshooting steps* 1. Verify card reader removal policy. 2. Make sure there is no physical damage to the card. 3. Inspect the ends of the memory cards for dirt or material closing a hole or spoiling a metal contact. Clean the contacts with a lint-free cloth and small amounts of isopropyl alcohol. Replace the memory card if necessary. 4. Reinstall and update the drivers for the card reader. 5. Make sure the smart card reader is compliant with ISO 7816 Class A, B, and C. 6. Reinsert the card reader with correct face as described in its documentation. 7. Check reader function with a verified working card.
	CAUTION: If the card reader has an in-use indicator light, do not insert or remove memory cards while the light is flashing. Doing so may cause loss of data on the card or may permanently damage the card reader.

Speaker, headphone – audio issues

Items	Procedures
Symptoms ● No sound from external or internal speakers ● Distorted sound, too soft, too loud, intermittent	*Possible causes* Volume turned down, sound card not recognized, malfunctioning hardware, electronic interference.
	Troubleshooting steps 1. Remove any device connected to the Audio jack to enable the internal speaker. 2. Close all open programs. 3. Adjust volume by pressing Fn + F6/F7. Be sure that volume button light is not amber (mute). - or - Adjust Windows volume control by clicking the speaker icon on the Windows taskbar. Be sure that the sound is not muted. 4. Verify that sound card is detected in Windows Device Manager. 5. Reinstall the **latest audio driver**. 6. Test audio device using HP PC Hardware Diagnostics (UEFI) tool (F2 > **Component Tests** > **Audio**). 7. Test with a verified working operating system. If issue is resolved, restore full operating system. 8. Test with verified working external speakers or headset. 9. Reseat internal speaker connections. 10. Test with verified working internal speakers. 11. Replace internal speakers.
No sound from headphones	1. Adjust volume by pressing Fn + F6/F7. Be sure that volume button light is not amber (mute). Or adjust Windows volume control by clicking the speaker icon on the Windows taskbar. Be sure that the sound it not muted. 2. Check headphone cable connection. 3. Test with a verified working audio board. 4. Replace audio board and verify the change.
No sound from external speakers	1. Verify that external speakers are turned on. 2. Disconnect headphones from headphone jack. 3. Adjust volume by pressing Fn + F6/F7. Be sure that volume button light is not amber (mute). - or - Adjust Windows volume control by clicking the speaker icon on the Windows taskbar. Be sure that the sound is not muted. 4. Check for possible interference devices nearby that may impact the audio (cell phone or portable communications handset.)

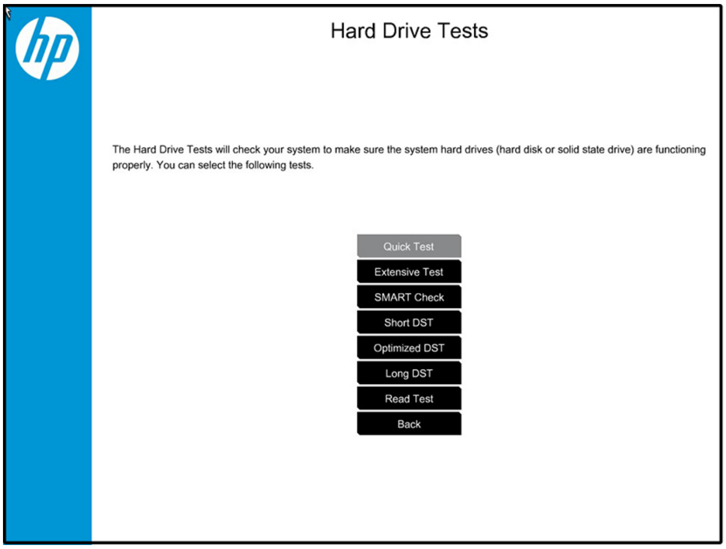
Thunderbolt (TB)

Items	Procedures
Symptom Thunderbolt device not working	*Possible causes* BIOS, drivers, and user settings.
	Troubleshooting steps 1. Update to the latest BIOS and choose appropriate TB Port settings. 2. Reset **User Account Settings** to default. 3. Update Intel Thunderbolt software that includes firmware version (for TB controller), driver version (operating system driver), and application version.  Thunderbolt™ Settings Thunderbolt™ Information Security Level: No security (SL0) Firmware Version: 11.80 Driver Version: 2.0.4.8 Application Version: 2.0.4.54 Device Connection Options ○ Only allow Thunderbolt Certified for PC devices ● Allow any Thunderbolt device Thunderbolt devices not certified for PC may not operate properly. ☑ Override first device in chain restriction Some Thunderbolt devices are restricted to being the first device in the chain. Overriding this restriction allows you to use these devices anywhere in the Thunderbolt chain, but may result in lower performance or quality of service. 4. Verify that TB device is detected in Windows Device Manager. 5. Verify TB port, cable and connection. 6. Test with a verified working TB board, if possible. NOTE: Thunderbolt is new technology. Thunderbolt cable and Thunderbolt device must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see https://thunderbolttechnology.net/products.

Storage

NOTE:

- Back up all critical data prior to drive troubleshooting.
- Prior to contacting support, HP recommends that you run a drive (HDD, SSD, M.2 drive) test using the HP PC Hardware Diagnostics (UEFI) tool on the suspected failed drive.
- Diagnose the hard drive using BIOS, Diagnostics built in the shipping image, or an external USB (http://www8.hp.com/us/en/campaigns/hpsupportassistant/pc-diags.html?jumpid=va_r602_us/en/any/pps/pl_ot_ob_ds_pd/HP_PC_Hardware_Diagnostics_cc/dt).
- The drive quick test is recommended to quickly (less than 10 minutes) identify the malfunctioning drive. If the issue still exists, run Extensive Test (more than 2 hours, or loop mode, which will run until an error occurs).
- If any test fails, record failure code and contact support for instructions on how to order a replacement hard drive.
- If all of the tests pass, the hard drive is not damaged. As a rule, HP will not replace a hard drive under warranty that does not fail the HP Hard Drive Self-Test.
- If there is no physical problem with the hard drive (or memory), then try reinstalling the Windows operating system to troubleshoot the problem.



Hard Drive Tests

The Hard Drive Tests will check your system to make sure the system hard drives (hard disk or solid state drive) are functioning properly. You can select the following tests.

Hard drive/solid-state drive not recognized

Items	Procedures
Symptom	*Possible causes*
Hard drive is not recognized during POST	Loose connection, faulty hard drive, faulty drive configuration/BIOS setting.
	Troubleshooting steps 1. Perform a hard reset (8. Hard reset on page 70). 2. Reset BIOS to default. 3. Verify hard drive connection and flex cable. Reseat hard drive and cable connection. For multiple storage devices, keep the primary drive with the operating system and remove other devices. 4. Use the HP Hardware Diagnostics tool to verify the drive is recognized and test it. 5. If the hard drive fails diagnostics, record failure and have the drive replaced. 6. Identify when the issue is related to software. If the hard drive passes diagnostics, test the drive on a verified working computer. If the failure follows the drive, reinstall the operating system to make sure software is not an issue. 7. Test with a verified working hard drive. If it is still not recognized, the system board is faulty. NOTE: If the drive is seen in BIOS and Diagnostics, try a secure erase prior to replacing a drive as this may resolve related issues.

No boot to operating system (no read/write error)

Items	Procedures
Symptoms	*Possible causes*
• Post error message: Boot Device not found (3F0) • Hang when booting to operating system	Operating system, loose connection, faulty hard drive, BIOS configuration, Secure Boot.
	Troubleshooting steps 1. Verify if Secure Boot is enabled in BIOS. Secure Boot prevents legacy boot devices from starting the computer, including bootable CDs and DVDs. For more information, see http://support.hp.com/us-en/document/c03653226. 2. Reset BIOS to default. Be sure that BIOS **Boot Mode** in **Boot Option** is set up properly for bootable device and its operating system (i.e., UEFI Native for Windows 8). Another example, choosing **Legacy Boot Order** for an UEFI device will cause "Boot Device not found (3F0)" error. 3. Verify hard drive connection and flex cable. Reseat connection. For multiple storage devices, keep the primary drive with the operating system and remove other devices. 4. Use PC Hardware Diagnostics tool to test. Record failure code and have the hard drive replaced. 5. If there is no error, reinstall the operating system using HP Restore.

Items	Procedures
	6. Test with a verified working operating system hard drive, if available.
Note	If there is a hard drive POST error message, see POST Error Messages and User Actions on page 123.

Read-write error

Items	Procedures
Symptoms - Post error message (i.e., error code 301) - Hang when working on data, files, documents	*Possible causes* Loose connection, faulty hardware.
	Troubleshooting steps 1. Perform a hard reset (8. Hard reset on page 70). 2. Reset BIOS to default (9. Soft reset (Default Settings) on page 71). 3. Verify drive connection and flex cable. Reseat connection (10. Reseat cables and connections on page 72). 4. Use the HP Hardware Diagnostics tool to test. If failed, record failure code and have the hard drive replaced. 5. If no error with HP PC Hardware Diagnostics (UEFI) tool, try to repair the hard drive and its files in Windows (using command "`CHKDSK /f /r /x`"). Use HP Restore to reinstall the operating system, if needed. 6. Test with a verified working hard drive. If it is not recognized, the system board is faulty.
Note	If there is a hard drive POST error message, see POST Error Messages and User Actions on page 123.

Slow performance

Items	Procedures
Symptoms Slow performance even when performing small read/write operations	*Possible causes* Operating system files, hard drive is full.
	Troubleshooting steps 1. Transfer data from the hard drive to create more space. Microsoft recommends at least 200 MB to sync system files. 2. Perform disk defragmentation to consolidate fragmented data on the hard drive so it will work more efficiently. NOTE: Do not defrag an SSD.
Tips & tricks	For optimal system performance, you need to place your operating system and all of your most commonly used applications and files in the fastest hard drive (solid-state drive) and fastest areas on the drive (primary partition of 200 GB max). See Routine Maintenance for Performance Improvement on page 125).

Blue screen (BSOD) error

Faulty hard drive may cause blue screen error. Perform the drive tests using the HP Diagnostics Tool to make sure the drive is functional. If all of the tests pass, see Common Blue Screen Error Messages on page 125 for detailed troubleshooting steps.

Noisy hard drive

IMPORTANT: An SSD has no moving parts, so it does not make loud or clicking noise.

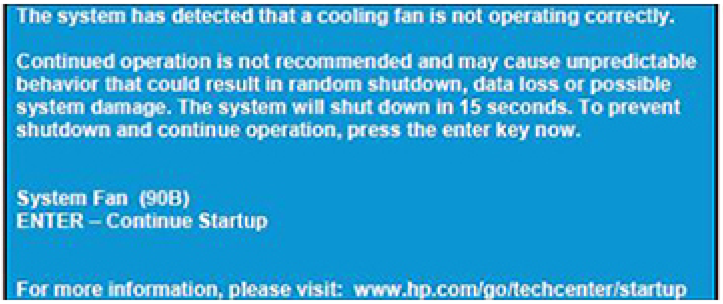
Depending on type and rotational speed, some hard drives will make more noise then others.

Not all noises are related to the fan or hard drive.

Items	Procedures
Symptoms	*Possible causes*
• Loud noise from hard drive • Clicking noise from hard drive • Still boots to operating system and operates normally	BIOS, hard drive firmware, driver, faulty drive, power supply (AC adapter).
	Troubleshooting steps 1. Update BIOS and hard drive firmware. 2. Examine AC adapter to be sure that it is not faulty or overloaded. Disconnect all peripherals (USB storages, dock, etc.). 3. Remove hard drive to isolate the noise. 4. Test the hard drive on a verified working computer if the noise continues. If the hard drive makes the same noise or clicking sounds, the sounds are either normal sounds for the hard drive or a fault with the hard drive. 5. Verify original hard drive connection and flex cable. Reseat hard drive and connection. 6. Run HP PC Hardware Diagnostics (UEFI). If failed, record failure code and have the hard drive replaced. 7. If no error with HP PC Hardware Diagnostics (UEFI), perform disk defragmentation (some hard drives make a clicking noise when highly fragmented).
Tips & tricks	For optimal system performance, place your operating system and all of your most commonly used applications and files on the fastest hard drive or solid-state drive and on the fastest areas on the drive (primary partition of 200 GB max). See Routine Maintenance for Performance Improvement on page 125).

Mechanical

Fan error message - 90B

Items	Procedures
Symptoms Fan error 90B at boot CAUTION: May lead to system shutdown, data loss or possible system damage.	*Possible causes* Defective fan; out-of-date BIOS. • The system fan is not spinning or not spinning properly (loose connection, fan is stuck or defective). • The temperature inside the case is too high, and the fan cannot spin fast enough to remove the heat due to an obstruction to air flow.  The system has detected that a cooling fan is not operating correctly. Continued operation is not recommended and may cause unpredictable behavior that could result in random shutdown, data loss or possible system damage. The system will shut down in 15 seconds. To prevent shutdown and continue operation, press the enter key now. System Fan (90B) ENTER – Continue Startup For more information, please visit: www.hp.com/go/techcenter/startup
	Troubleshooting steps General actions 1. Update BIOS and drivers (4. Update BIOS and drivers on page 63) or reset BIOS to default. BIOS may implement new fan characteristics and updates for other components. 2. Perform a hard reset (8. Hard reset on page 70). Performing a hard reset can reset recorded thermal values in memory.
	Thermal-related issue 1. Verify thermal condition: a. Check fan and connection. Reseat fan cable. b. Be sure that no obstructions or dust are in heat sink fan, fin, or vent. c. Test fan using HP PC Hardware Diagnostics (UEFI) tool (6. HP Hardware Diagnostics and Tools on page 64). Be sure that the fan is not producing loud noise and that fan blades spin correctly. d. Test with a verified working fan. e. Remove old thermal compound and pads, and replace properly with new pads. 2. Verify thermal solution ▲ Use Thermal Monitor tool (available only to authorized service providers/technicians) to run stress test (processor and GPU) and verify that thermal sensors are within limits after thermal condition is serviced.
Note	BIOS currently omits fan presence detection to shorten boot time delay less than four seconds. Therefore, the fan error is generated based on previous boot to operating system that found system fan error. Fan often is part of thermal solution, including heat sink, fin/ muffler, and thermal grease. Fan replacement requires reboot and fan function verification using HP PC Hardware Diagnostics (UEFI) tool.

Items	Procedures
	See https://support.hp.com/us-en/document/c01657439.

Noise (sound)

Items	Procedures
Symptoms	*Possible causes*
Computer emits abnormal noise	Aside from basic components (power adapter/supply, fan, speaker, hard drive, optical drive, display panel, external devices), it is also common for electronic components to produce noise.
	Troubleshooting steps 1. Inspect external power source and change to verified working one. 2. Determine whether the noise comes from AC power adapter. Test with a verified working AC adapter.
	Disconnect external devices and all cables connected to the computer to isolate issue to computer only.
Noisy fan	Determine whether the noise comes from the fan. Disconnect the fan briefly to isolate whether noise originates from fan. If noise is absent with fan disconnected, refer to Fan runs constantly on page 117.
Noisy hard drive	Determine whether the noise comes from the hard drive. See Noisy hard drive on page 114.
Noisy optical drive	1. Determine whether the noise comes from an optical drive. 2. Remove CD/DVD from the optical drive.
Noisy speaker	1. Determine whether the noise comes from speaker. 2. Test with a verified working external headset/speaker.
Noisy display	Determine whether the noise comes from display panel (humming noise). Change display frequency settings. See Display on page 97.
The section below is intended for authorized service providers/technicians.	
	1. After disassembling the chassis, inspect components of the interior for excessive wear or damage. 2. If noise issues persist, proceed with process of elimination for battery, AC adapter, or boards.

Fan runs constantly

Items	Procedures
Symptoms - Fan never stops running - Generates heat - Decreased computer performance	*Possible causes* - BIOS not up to date. - Thermal condition (fan, air flow)--fan may not be defective but must run constantly to remove excess heat generated by electrical components. - Inappropriate configuration.
	Troubleshooting steps **General actions** 1. Verify whether BIOS is set to **Fan Always on while on AC Power** F10 Setup. When booting the computer, press F10 to open Setup, and then select **Advanced** > **Built-In Device Options Menu**. 2. Update BIOS and drivers (4. Update BIOS and drivers on page 63) and reset BIOS to default. BIOS may implement new fan characteristics and updates for other components. 3. Perform a hard reset (8. Hard reset on page 70). Performing a hard reset can reset recorded thermal values in memory.
	Thermal-related issue 1. Verify fan is spinning. Reseat fan cable before moving to next step. a. Check fan and connection. Reseat fan cable. b. Be sure that no obstructions or dust are in heat sink fan, heat sink fin, or vent. c. Test fan using HP PC Hardware Diagnostics (UEFI) tool (6. HP Hardware Diagnostics and Tools on page 64). Be sure that the fan is not producing loud noise and that fan blades spin correctly. d. Test with a verified working fan. e. Replace the fan. 2. Verify thermal solution Use Thermal Monitor tool (available only to authorized service providers/ technicians)(HP Thermal Monitor on page 67) to run stress test (processor and GPU) and verify that thermal sensors are within limits after thermal condition is serviced.
	User configuration Change Power Options in Windows (i.e., choosing **Balanced mode** instead of **High performance**). High performance and extensive graphics may cause the fan run constantly to release the heat.
Notes	BIOS currently omits fan presence detection to shorten boot time delay less than four seconds. Therefore, the fan error is generated based on previous boot to operating system that found system fan error. Fan often is part of thermal solution, including heat sink, heat sink fin/muffler, and thermal grease. Fan replacement requires reboot and fan function verification using HP PC Hardware Diagnostics (UEFI) tool. For more information, see the following links: - http://support.hp.com/us-en/document/c01007591. - https://support.hp.com/us-en/document/c01657439.

Thermal shutdown (hot)

Items	Procedures
Symptoms Similar to fan runs constantly issue (Fan runs constantly on page 117) ● System shutdown ● Abnormal heat ● Continually running fan ● Decreased computer performance	*Possible causes* BIOS not up to date, thermal condition (fan, air flow)
	Troubleshooting steps 1. Update BIOS and drivers (4. Update BIOS and drivers on page 63) and reset BIOS to default. BIOS may implement new fan characteristics and updates for other component. 2. Perform a hard reset (8. Hard reset on page 70). Performing a hard reset can reset recorded thermal values in memory. 3. Determine whether you are using a correct AC adapter. 4. Be sure to turn power off completely when putting a notebook in a travel bag.
 	Thermal-related issue 1. Verify thermal condition: a. Check fan and connection. Reseat fan cable. b. Be sure that no obstructions or dust are in heat sink fan, fin, or vent. c. Be sure that the notebook is not sitting on a hot surface that blocks vent intakes. d. Test fan using HP PC Hardware Diagnostics (UEFI) tool (6. HP Hardware Diagnostics and Tools on page 64). Be sure that the fan is not producing a loud noise and that fan blades spin correctly. e. Test with a verified working fan. f. Remove old thermal compound and pads, and replace properly with new pads. 2. Verify thermal solution: ○ Use Thermal Monitor tool (available only to authorized service providers/technicians) to run stress test (processor and GPU) and verify that thermal sensors are within limits after thermal condition is serviced.
Note	See https://support.hp.com/us-en/document/c01657439.

Stuck power button

Items	Procedures
Symptoms • Rear power indicator light is on • Will not turn on when power button is pressed • Automatically powers on	*Possible causes* Sticky or defective power button.
	Troubleshooting steps **General actions** 1. Perform a hard reset (8. Hard reset on page 70). 2. Perform a soft reset if system can turn on.
The sections below are intended for authorized service providers/technicians.	
	1. Disassemble the unit. 2. Inspect power button on the top cover and on the system board to make sure these buttons moves freely.

Additional information

The following sections provide additional information that can be used during the troubleshooting process.

Acronyms

The following acronyms are used in this chapter.

Blue screen (BSOD)—A Windows error screen that can occur if a problem causes your computer to shut down or restart unexpectedly. When you experience this type of error, you will not be able to see items such as the Start menu or the taskbar when your computer is turned on. Instead you might see a blue screen with a message that your computer ran into a problem and needs to restart.

CPU—Central processing unit

DIMM—Dual in-line memory module

Daughterboard—Type of circuit board that plugs into or is attached to the system board or similar expansion card to extend its features and services.

GPU–Graphics processor unit

GTS–General Troubleshooting Step

HDD–Hard drive

KB–Keyboard

LVDS–Low-Voltage Differential Signaling

MSG–Maintenance and Service Guide

mWS–Mobile Workstations

WS–Workstations

OS–Operating system

PC–Personal computer

POST–Power-On Self-Test

SSD–Solid-state drive

TSG–Troubleshooting Guide

UEFI–Unified Extensible Firmware Interface

WLAN–Wireless local area network

WWAN–Wireless wide area network

Blinking lights and boot error codes

The information below is from the white paper http://h10032.www1.hp.com/ctg/Manual/c04685655.

In some cases, when the host processor is not executing code or does not have the necessary code to drive the display, light blink codes inform you of a problem.

Table 6-7 Boot-error codes

Blink codes	Error
Amber battery light: blinks 1 Hz continuously	Embedded Controller unable to load firmware
Caps/num lock lights = 1 blink	Processor not executing code
Caps/num lock lights = 2 blinks	BIOS recovery code unable to find valid BIOS recovery image
Caps/num lock lights = 3 blinks	Memory module error
Caps/num lock lights = 4 blinks	Graphics controller error
Caps/num lock lights = 5 blinks	System board error
Caps/num lock lights = 6 blinks	Intel Trusted Execution Technology (TXT) Error
Caps/num lock lights = 7 blinks	Sure Start unable to find valid BIOS Boot Block image
Caps/num lock lights = 8 blinks	Sure Start has identified a problem (Manual Recovery Policy Set)

Processor not executing code

This computer has experienced a problem due to the failure of certain code to execute, resulting in a failed startup of the processor. The issue could be related to the processor or the system board in the computer. If the processor is socketed, be sure that the processor is seated correctly in the socket. If this error reoccurs, refer to General troubleshooting steps on page 59.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink once** followed by a pause, and then continue in a repeating pattern.

BIOS recovery code unable to find valid BIOS recovery image

This computer has experienced a problem in locating a valid BIOS image, resulting in a failed startup. This problem may be resolved by placing a clean copy of the system BIOS on a USB key or in the appropriate hard drive directory and performing a reboot. If this error reoccurs, refer to General troubleshooting steps on page 59.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink twice** followed by a pause, and then continue in a repeating pattern.

Memory module error

This computer has experienced a memory initialization problem resulting in a failed startup. This issue may be related to the memory modules in the computer. This problem may be resolved by ensuring that memory modules are correctly inserted and seated. If this error reoccurs, a service event is required to determine the source of the error (memory modules or system board) and take the appropriate corrective action.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink three times** followed by a pause, then continue in a repeating pattern.

Graphics Controller Error (No Controller)

This computer has experienced a graphics controller initialization problem resulting in a failed startup. This issue may be related to the graphics controller in your machine. This problem may be resolved by ensuring that the graphics controller module is seated correctly in machines with modular graphics. If this error reoccurs, a service event is required to identify the source of the error and take the appropriate corrective action.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink four times** followed by a pause, then continue in a repeating pattern.

Failure – System Board Error

This computer has experienced a system board initialization problem resulting in a failed startup. This issue may be related to the system board in the computer. A service event is required to identify the source of the error and take the appropriate corrective action.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink five times** followed by a pause, then continue in a repeating pattern.

Intel Trusted Execution Technology (TXT) Error

This computer has experienced a problem related to the Intel Trusted Execution Technology resulting in a failed startup. The error occurs when all of the following are true:

- The Intel Trusted Execution Technology (TXT) has been enabled on the computer.
- Policies have been set to prevent startup if the BIOS measurement has changed.
- The BIOS measurement has changed.

For more information about Intel TXT, go to http://www.intel.com/content/dam/www/public/us/en/documents/white-papers/trusted-execution-technology-security-paper.pdf.

A service event is required to resolve this issue.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink six times** followed by a pause, then continue in a repeating pattern.

Sure Start unable to find valid BIOS Boot Block image

This computer has experienced a problem in locating a valid BIOS image, resulting in a failed startup. A service event is required to identify the source of the error and take appropriate corrective action.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink seven times** followed by a pause, then continue in a repeating pattern.

Sure Start has identified a problem (Manual Recovery Policy Set)

This computer has experienced a problem in locating a valid BIOS image, resulting in a failed startup. HP Sure Start will normally repair this type of issue; however, on this computer HP Sure Start has been configured to operate in manual mode key sequence. To proceed with the repair, press and hold the following keys: <ESC>+<UP arrow>+<DOWN arrow>. To avoid the need for this manual recovery step, set the HP Sure Start recovery policy to automatic. If this error reoccurs, a service event is required to identify the source of the error and take appropriate corrective action.

NOTE: The computer will attempt to notify you of this problem through a series of blinking lights. When you attempt to turn on the computer from an “Off” or “Hibernated” state, lights associated with the caps lock and num lock keys will both **blink eight times** followed by a pause, then continue in a repeating pattern.

POST Error Messages and User Actions

Test description	Failure descriptions	Error code	Possible user actions
Product information	Invalid value	00A	Contact support for assistance.
Startup test	Memory module	200	Attempt to reseat the memory module and then repeat the test. Search http://www.hp.com/support for details on troubleshooting issues related to the memory module. If the memory module still fails, contact support.
Startup test	Hard Disk 1 SMART	301	Attempt to reseat the hard drive and repeat the test. The hard disk drive may have failed. Contact support for assistance.
Startup test	Hard Disk 2 SMART	302	The hard drive may have failed. Contact support for assistance.
Startup test	Hard Disk 1 Quick	303	The hard drive may have failed. Contact support for assistance.
Startup test	Hard Disk 2 Quick	304	The hard drive may have failed. Contact support for assistance.
Run-in test	Memory module	200	Attempt to reseat the memory module and then repeat the test. Search http://www.hp.com/support for details on troubleshooting issues related to the memory module. If the memory module still fails, contact support.
Run-in test	Hard Disk 1 SMART	301	Attempt to reseat the hard drive and repeat the test. The hard drive may have failed. Contact support for assistance.
Run-in test	Hard Disk 2 SMART	302	The hard drive may have failed. Contact support for assistance.
Run-in test	Hard Disk 1 Quick	303	The hard drive may have failed. Contact support for assistance.
Run-in test	Hard Disk 2 Quick	304	The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 1 SMART	301	Attempt to reseat the hard drive and repeat the test. The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 2 SMART	302	The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 1 Quick	303	The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 2 Quick	304	The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 1 Full	305	The hard drive may have failed. Contact support for assistance.
Hard Disk Test	Hard Disk 2 Full	306	The hard drive may have failed. Contact support for assistance.
Boot Device Manager	Boot device not found	3F0	Indicates a potential problem with the hard drive. Please run the hard drive test. See https://support.hp.com/emea_africa-en/document/c01443371 for more information.
Boot Device Manager	Hard Disk 1 Error	3F1	Indicates a potential problem with the hard drive. Run the hard drive test. See https://support.hp.com/emea_africa-en/document/c01443371 for more information.
Boot Device Manager	Hard Disk 2 Error	3F2	Indicates a potential problem with the hard drive. Run the hard drive test. See https://support.hp.com/emea_africa-en/document/c01443371 for more information.

Test description	Failure descriptions	Error code	Possible user actions
Boot Device Manager	Hard Disk 1 SMART	301	Indicates a potential problem with the hard drive. Run the hard drive test. See https://support.hp.com/emea_africa-en/document/c01443371 for more information.
Boot Device Manager	Hard Disk 2 SMART	302	Indicates a potential problem with the hard drive. Run the hard drive test. See https://support.hp.com/emea_africa-en/document/c01443371 for more information.
BIOS Recovery	BIOS Recovery Occurred	500	This message indicates that BIOS recovery was completed successfully. No further action is required.
BIOS Application	BIOS Application Error	501	The BIOS installation may have become corrupted. Download the latest version of the BIOS and install it. See 4. Update BIOS and drivers on page 63 for more information. If reinstalling the BIOS fails, contact support for further assistance.
CMOS Recovery	CMOS Recovery Occurred	502	This message indicates that CMOS recovery was completed successfully. No further action is required.
Battery Check	Primary Battery Replace	601	This indicates that the primary battery has very low capacity. Search http://www.hp.com/support for details on using the HP Support Assistant to verify the battery capacity and, if necessary, order a replacement.
Battery Check	Secondary Battery Replace	602	This indicates that the secondary battery has very low capacity. Search http://www.hp.com/support for details on using the HP Support Assistant to verify the battery capacity and, if necessary, order a replacement.
Wireless Module	Not installed or responding	701	Reseat the wireless LAN adapter module, if your notebook supports it. Because seating or reseating a wireless LAN adapter is unique to each computer model. For more information, see the chapter titled “Removal and replacement procedures for Customer Self-Repair parts.”
Fan	Fan not operating correctly	90B	The system fan may be malfunctioning. For information on troubleshooting heat-related issues, see http://support.hp.com/us-en/document/c01007591. A hard reset can sometimes restore the system fan to working order. See https://support.hp.com/us-en/document/c01684768 for details. If the system fan continues to malfunction, contact support.

Routine Maintenance for Performance Improvement

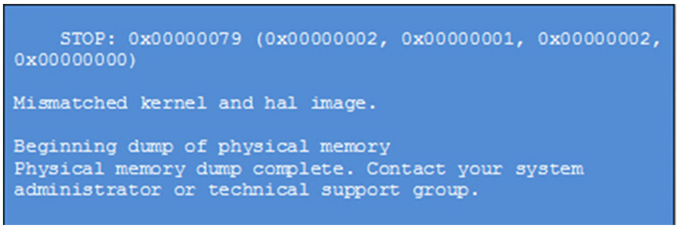
The following table presents a summary of the suggested times for performing the routine maintenance tasks described in this document.

Tasks	Weekly	Monthly	Occasionally
Perform a system tune up.	X		
Run Windows Update.	X		
Scan for and remove viruses.	X		
Scan for and remove spyware and adware.	X		
Empty the Recycle Bin.	X		
Delete temporary Internet files.	X		
Back up user files.		X	
Create a restore point.		X	
Defragment the hard drive.		X	
Run Scan Disk.		X	
Clean the exterior of the computer.			X
Close programs that are not being used.			X
Prevent programs from loading at startup.			X

Common Blue Screen Error Messages

Error message list

The following image shows an example of one possible “https://msdn.microsoft.com/en-us/library/windows/hardware/hh994433(v=vs.85).aspx” from Microsoft:



```
    STOP: 0x00000079 (0x00000002, 0x00000001, 0x00000002,
0x00000000)

Mismatched kernel and hal image.

Beginning dump of physical memory
Physical memory dump complete. Contact your system
administrator or technical support group.
```

The hexadecimal number following the word "STOP" is called the bug check code or Stop code. This is the most important item on the screen.

Bug check symbolic names

Each bug check code also has an associated symbolic name. In the example, the screen shows https://msdn.microsoft.com/en-us/library/windows/hardware/ff559209(v=vs.85).aspx (MISMATCHED_HAL).

Microsoft general troubleshooting of Windows bug check codes

- If you recently added hardware to the system, try removing or replacing it. Or check with the manufacturer to see if any patches are available.
- Try running HP PC Hardware Diagnostics (UEFI).
- Check with the manufacturer to see if an updated system BIOS or firmware is available.
- Be sure that any expansion board is properly seated and all cables are completely connected.
- Confirm that any new hardware that is installed is compatible with the installed version of Windows.
- If new device drivers or system services have been added recently, try removing or updating them.

NOTE: Use safe mode when removing or disabling components. Safe mode loads only the minimum required drivers and system services during the Windows startup. To enter safe mode, restart your computer and press F8 at the menu that displays the operating system choices. At the resulting **Windows Advanced Options** menu, choose **Safe Mode**.

- Run a virus detection program. Viruses can infect all types of hard drives formatted for Windows, and resulting drive corruption can generate system bug check codes. Be sure that the virus detection program checks the Master Boot Record for infections.
- Verify that the system has the latest service pack installed. To detect which service pack, if any, is installed on your system, click **Start**, click **Run**, type `winver`, and then press Enter. The **About Windows** dialog box displays the Windows version number and the version number of the service pack, if one has been installed.
- Disable BIOS memory options such as caching or shadowing.
- Check the System Log and Application Log in Event Viewer to see if any additional error messages have been logged recently. These might pinpoint the cause of the error.

Use Windows Debugging Tool

The https://msdn.microsoft.com/library/windows/hardware/ff551063%20(v=vs.85).aspx is one of the primary tools used by Microsoft software developers to analyze and resolve errors that result in memory dumps. Use the tool to determine the cause of the error. Follow general steps for downloading, setting up, and using the Windows 10 debugging tool. A similar process is used for Windows 7 or Windows 8.

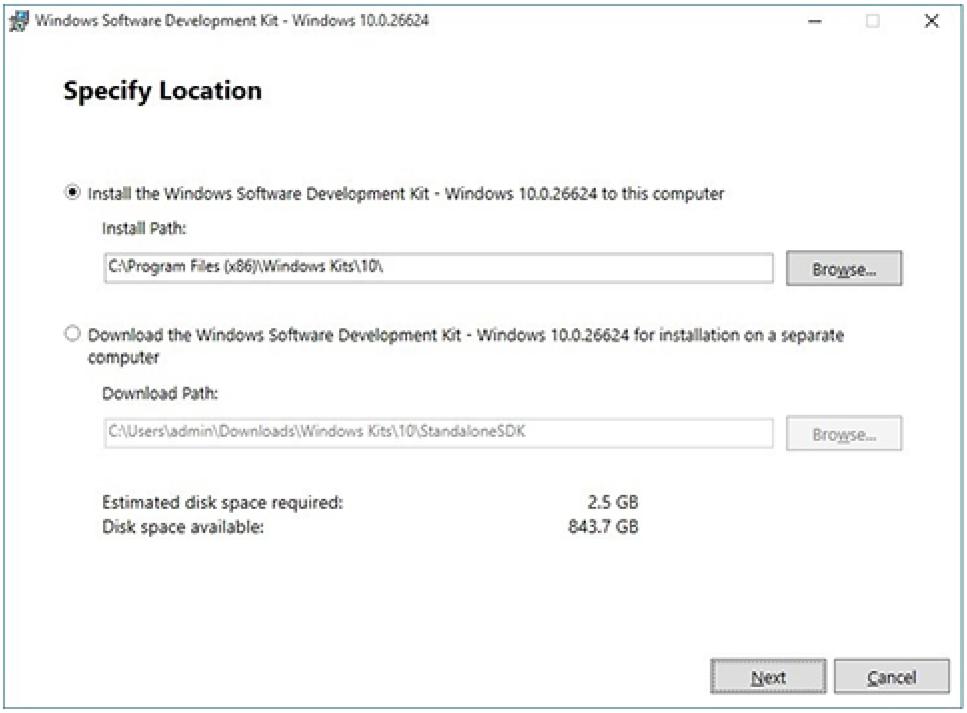
NOTE: The following screen shots provide only an example of the tool. Specifics shown are not representative of all applications of the debugging tool. This is a Microsoft tool supported by Microsoft.

Windows Software Development Kit (SDK)

1. Download the SDK from the following link:

   https://dev.windows.com/en-US/downloads/windows-10-sdk

2. Set up the SDK in the configuration window (Windows 10 shown).



Windows Software Development Kit - Windows 10.0.26624

Specify Location

● Install the Windows Software Development Kit - Windows 10.0.26624 to this computer

Install Path:

C:\Program Files (x86)\Windows Kits\10\

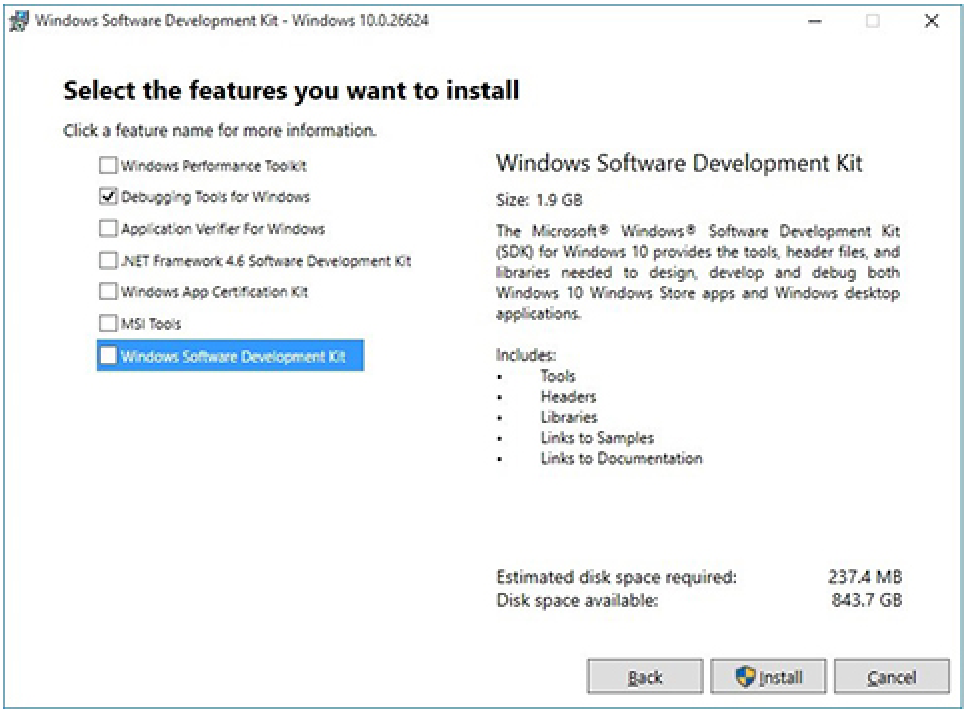
○ Download the Windows Software Development Kit - Windows 10.0.26624 for installation on a separate computer

Download Path:

C:\Users\admin\Downloads\Windows Kits\10\StandaloneSDK

Estimated disk space required: 2.5 GB
Disk space available: 843.7 GB

3. Select features to install.



Windows Software Development Kit - Windows 10.0.26624

Select the features you want to install

Click a feature name for more information.

- ☐ Windows Performance Toolkit
- ☑ Debugging Tools for Windows
- ☐ Application Verifier For Windows
- ☐ .NET Framework 4.6 Software Development Kit
- ☐ Windows App Certification Kit
- ☐ MSI Tools
- ☐ Windows Software Development Kit

Windows Software Development Kit

Size: 1.9 GB

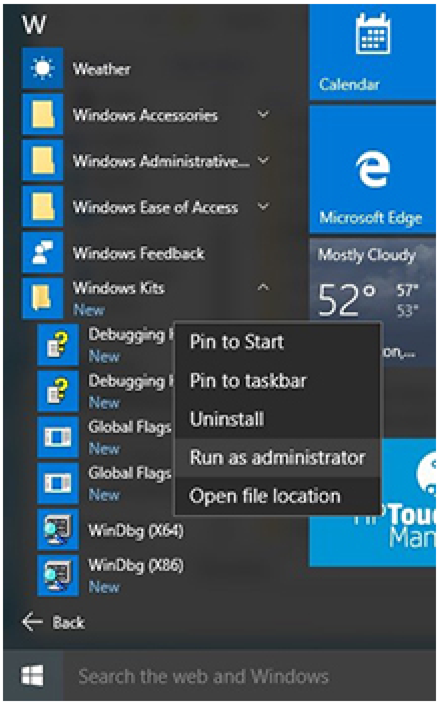
The Microsoft® Windows® Software Development Kit (SDK) for Windows 10 provides the tools, header files, and libraries needed to design, develop and debug both Windows 10 Windows Store apps and Windows desktop applications.

Includes:

- Tools
- Headers
- Libraries
- Links to Samples
- Links to Documentation

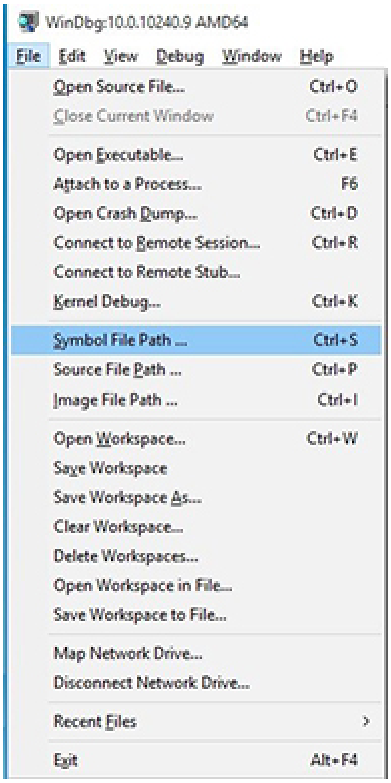
Estimated disk space required: 237.4 MB
Disk space available: 843.7 GB

4. Run the SDK as an administrator.

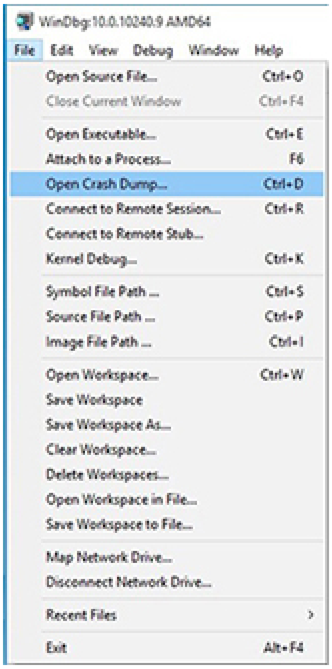

W
Weather
Windows Accessories
Windows Administrative...
Windows Ease of Access
Windows Feedback
Windows Kits
New
Debugging
New
Debugging
New
Global Flags
New
Global Flags
New
WinDbg (X64)
WinDbg (X86)
New
Back
Search the web and Windows
Calendar
Microsoft Edge
Mostly Cloudy
52°
57°
53°
Pin to Start
Pin to taskbar
Uninstall
Run as administrator
Open file location

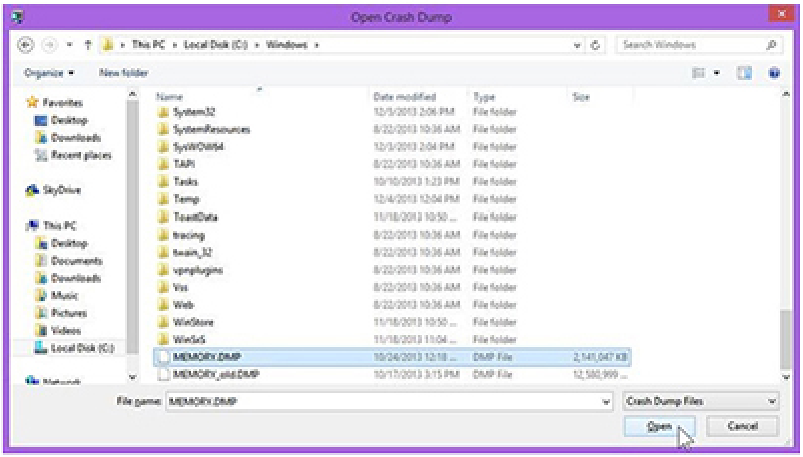
5. Set the symbol path. Select **File** > **Symbol File Path**.

- In the **Symbol path** box, type `SRV*C:\Windows\symbol_cache*http://msdl.microsoft.com/download/symbols`.
- Save the workspace.


WinDbg:10.0.10240.9 AMD64
File
Edit
View
Debug
Window
Help
Open Source File... Ctrl+O
Close Current Window Ctrl+F4
Open Executable... Ctrl+E
Attach to a Process... F6
Open Crash Dump... Ctrl+D
Connect to Remote Session... Ctrl+R
Connect to Remote Stub...
Kernel Debug... Ctrl+K
Symbol File Path ... Ctrl+S
Source File Path ... Ctrl+P
Image File Path ... Ctrl+I
Open Workspace... Ctrl+W
Save Workspace
Save Workspace As...
Clear Workspace...
Delete Workspaces...
Open Workspace in File...
Save Workspace to File...
Map Network Drive...
Disconnect Network Drive...
Recent Files
Exit Alt+F4

6. Open the crash dump file.


WinDbg:10.0.10240.9 AMD64
File
Edit
View
Debug
Window
Help
Open Source File... Ctrl+O
Close Current Window Ctrl+F4
Open Executable... Ctrl+E
Attach to a Process... F6
Open Crash Dump... Ctrl+D
Connect to Remote Session... Ctrl+R
Connect to Remote Stub...
Kernel Debug... Ctrl+K
Symbol File Path ... Ctrl+S
Source File Path ... Ctrl+P
Image File Path ... Ctrl+I
Open Workspace... Ctrl+W
Save Workspace
Save Workspace As...
Clear Workspace...
Delete Workspaces...
Open Workspace in File...
Save Workspace to File...
Map Network Drive...
Disconnect Network Drive...
Recent Files
Exit Alt+F4

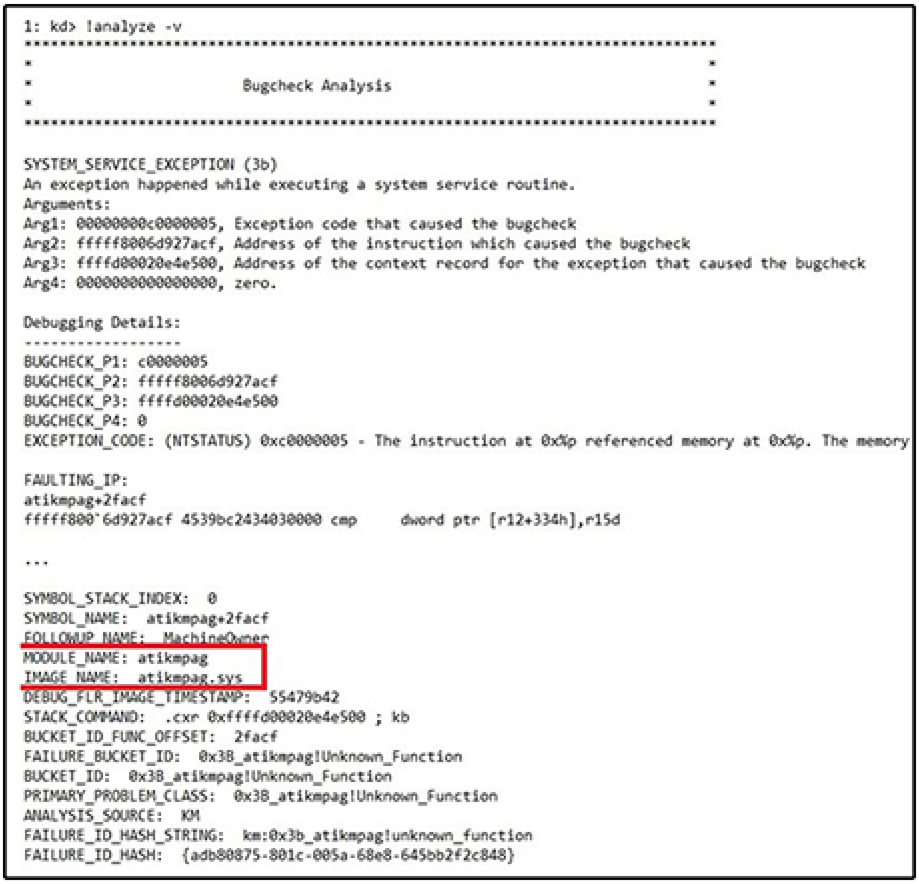

Open Crash Dump
This PC
Local Disk (C:)
Windows
Search Windows
Organize
New folder
Favorites
Desktop
Downloads
Recent places
SkyDrive
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Network
Crash Dump Files
Open
Cancel

Name	Date modified	Type	Size
System32	12/3/2013 2:06 PM	File folder	
SystemResources	8/22/2013 10:36 AM	File folder	
SysWOW64	12/3/2013 2:04 PM	File folder	
TAPI	8/22/2013 10:36 AM	File folder	
Tasks	10/10/2013 1:23 PM	File folder	
Temp	12/4/2013 12:04 PM	File folder	
ToastData	11/18/2013 10:50 ...	File folder	
tracing	8/22/2013 10:36 AM	File folder	
twain_32	8/22/2013 10:36 AM	File folder	
vpnplugins	8/22/2013 10:36 AM	File folder	
Vss	8/22/2013 10:36 AM	File folder	
Web	8/22/2013 10:36 AM	File folder	
WinStore	11/18/2013 10:50 ...	File folder	
WinSxS	11/18/2013 11:04 ...	File folder	
MEMORY.DMP	10/24/2013 12:18 ...	DMP File	2,141,047 KB
MEMORY_old.DMP	10/17/2013 3:15 PM	DMP File	12,580,999 ...

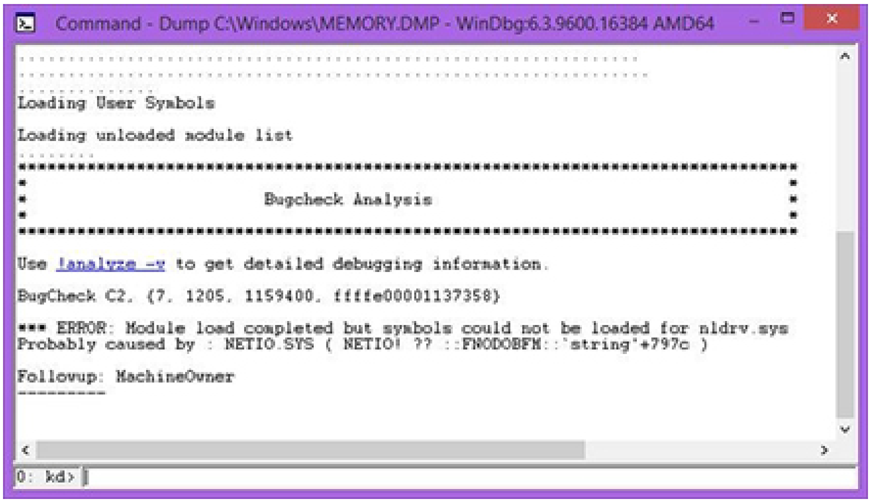
File name: MEMORY.DMP

7. Analyze the file. In the following memory dump sample, look for Bug Check 0x3B. The ATIKMAG driver needs to be investigated for further root cause.

Lookup for Bug Check 0xC2.



```
1: kd> !analyze -v
*******************************************************************************
*                                                                             *
*                        Bugcheck Analysis                                    *
*                                                                             *
*******************************************************************************

SYSTEM_SERVICE_EXCEPTION (3b)
An exception happened while executing a system service routine.
Arguments:
Arg1: 00000000c0000005, Exception code that caused the bugcheck
Arg2: fffff8006d927acf, Address of the instruction which caused the bugcheck
Arg3: ffffd00020e4e500, Address of the context record for the exception that caused the bugcheck
Arg4: 0000000000000000, zero.

Debugging Details:
------------------
BUGCHECK_P1: c0000005
BUGCHECK_P2: fffff8006d927acf
BUGCHECK_P3: ffffd00020e4e500
BUGCHECK_P4: 0
EXCEPTION_CODE: (NTSTATUS) 0xc0000005 - The instruction at 0x%p referenced memory at 0x%p. The memory

FAULTING_IP:
atikmpag+2facf
fffff800`6d927acf 4539bc2434030000 cmp     dword ptr [r12+334h],r15d

...

SYMBOL_STACK_INDEX:  0
SYMBOL_NAME:  atikmpag+2facf
FOLLOWUP_NAME:  MachineOwner
MODULE_NAME: atikmpag
IMAGE_NAME:  atikmpag.sys
DEBUG_FLR_IMAGE_TIMESTAMP:  55479b42
STACK_COMMAND:  .cxr 0xffffd00020e4e500 ; kb
BUCKET_ID_FUNC_OFFSET:  2facf
FAILURE_BUCKET_ID:  0x3B_atikmpag!Unknown_Function
BUCKET_ID:  0x3B_atikmpag!Unknown_Function
PRIMARY_PROBLEM_CLASS:  0x3B_atikmpag!Unknown_Function
ANALYSIS_SOURCE:  KM
FAILURE_ID_HASH_STRING:  km:0x3b_atikmpag!unknown_function
FAILURE_ID_HASH:  {adb80875-801c-005a-68e8-645bb2f2c848}
```



Command - Dump C:\Windows\MEMORY.DMP - WinDbg:6.3.9600.16384 AMD64

```
..............................................................
...............................................................
................
Loading User Symbols

Loading unloaded module list
.........
*******************************************************************************
*                                                                             *
*                        Bugcheck Analysis                                    *
*                                                                             *
*******************************************************************************

Use !analyze -v to get detailed debugging information.

BugCheck C2, {7, 1205, 1159400, ffffe00001137358}

*** ERROR: Module load completed but symbols could not be loaded for nldrv.sys
Probably caused by : NETIO.SYS ( NETIO! ?? ::FNODOBFM::`string'+797c )

Followup: MachineOwner
---------

0: kd>
```

Display Issue: Pixel Anomalies

All HP notebook displays adhere to strict quality and reliability specifications. A small percentage of display panels may have minor cosmetic manufacturing anomalies or irregularities such as bright or dark dots in the viewable area. These cosmetic imperfections are common to all display panel types and are not specific to any HP model or product line.

All display panel defects should be examined at the highest possible resolution using both the brightest and darkest possible backgrounds, because some sub-pixel failures may not be readily visible under certain conditions.

- Type 1: Bright dot on a dark background = Always On
- Type 2: Dark dot on a bright background = Always Off
- Combination = in any combination and any color that are always on or off

Use the HP PC Hardware Diagnostics (UEFI) tool to determine numbers of pixels and their distance. HP uses the following set of criteria when damaged displays are submitted for warranty coverage.

Source: http://support.hp.com/us-en/document/c00035844

Table 6-8 Electrical defect allowances

Panel resolution	Accept	Reject
Sub-pixel faults		
VGA, SVGA, SD, WSVGA, XGA, 720p, SD+, WXGA, HD	N ≤ 2 Type 1 N ≤ 2 Type 2	N ≥ 3 Type 1
WXGA+, SXGA+, HD+, SXGA+	N ≤ 3 Type 1 N ≤ 3 Type 2	N ≥ 4 Type 1
WSXGA+, UXGA, FHD, WUXGA	N ≤ 4 Type 1 N ≤ 4 Type 2	N ≥ 5 Type 1
QHD, QHD+, WQXGA, UD	N ≤ 5 Type 1 N ≤ 5 Type 2	N ≥ 6 Type 1
Electrical defect clusters (defects within a 5x5 pixel block)		
Minimum distance between ANY allowable defects (unless otherwise specified)	S ≥ 25 mm	S < 25 mm
Cluster with 2 or more sub-pixels with sub-pixel faults		Not allowed
Dim lines		Not allowed
Cross line(s) on/off		Not allowed
Horizontal line(s) on/off		Not allowed
Vertical line(s) on/off		Not allowed

NOTE: All LCD panel defects should be examined at the highest possible resolution using both the brightest and darkest possible backgrounds, as some sub-pixel failures may not be readily visible under certain conditions.

NOTE: Contact support for assistance if issues are not listed.

Cable management

Proper routing of the internal cables is critical to the operation of the computer. Follow good cable management practices when removing and installing components.

- Handle cables with care to avoid damage.
- Apply only the tension required to seat or unseat cables during insertion or removal from the connector.
- When possible, handle cables by the connector or pull-strap.
- Route cables in such a way that they cannot be caught or snagged by parts being removed or replaced.
- Keep cables away from direct contact with major heat sources, such as the heat sink. (Some air flow guides have a cable guide that lets you route cables safely around the heat sink.)
- Do not jam cables on top of daughterboards or memory modules (DIMMs). Circuit cards and DIMMs are not designed to take excessive pressure.
- Keep cables clear of any movable or rotating parts (such as a fan) to prevent them from being cut or crimped when the component is lowered into its normal position.
- In all cases, avoid bending or twisting the cables. Do not bend any cable sharply. A sharp bend can break the internal wires.
- Do not rely on components like the keyboard or service door to push cables down internally. Always position the cables to lay properly by themselves or in the cable guides and chassis areas designed for cable routing.

⚠ CAUTION: Always release connector latch before removing the cable. Otherwise, pulling the cable could damage the cable pins and result in a failed device.

Connector types

IMPORTANT: Connector pins and connector gold fingers should not be touched directly with bare hands.

There are several different types of connectors on the system board with different requirements for cable removal or insertion.

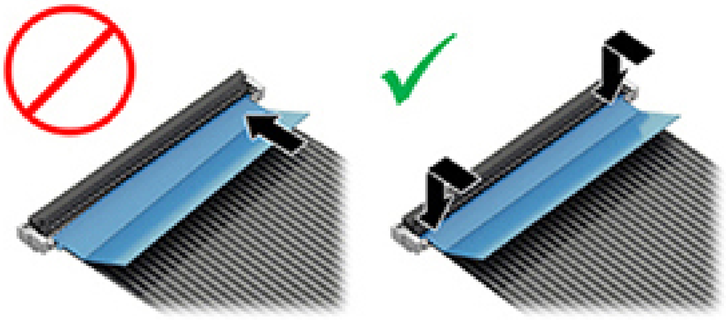
Flex cable

When connecting flex cables to a ZIF connector, rotate the latch to 90 degrees, push the cable completely, evenly into the connector, and then close the latch.

When removing flex cables from a ZIF connector on the system board, the latch must be released before the cable can be removed. Always follow these steps:

1. Flip the connector latch 90 degrees to release the cable.
2. Grasp the cable end of the connector and pull it straight out.

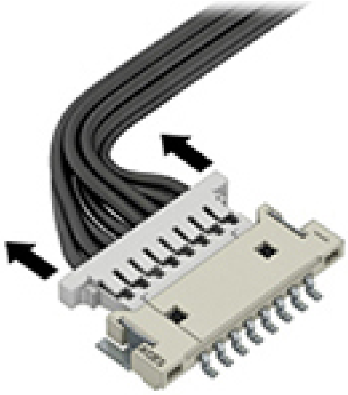
CAUTION: Always release connector latch before removing the cable. Otherwise, pulling the cable could damage the cable pins and result in a failed device.



Horizontal installation cable

Use flat tool to pull connector evenly. Do not pull on cable to remove.

Slide connector into receptacle on same horizontal plane as board and use flat tool to push evenly into receptacle.



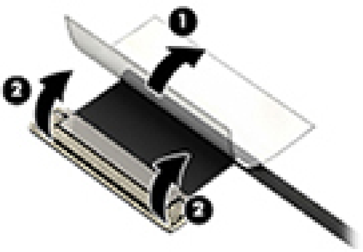
Multi-pin horizontal insert connector (LVDS cable to display panel)

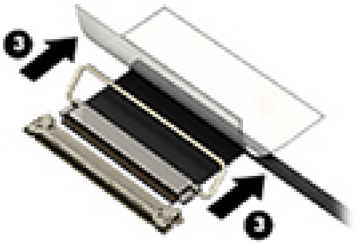
Insert procedure:

1. Slide connector evenly into receptacle on same horizontal plane as PCB connector.
2. Pull lock bar to insert and push both side connector horizontally to firmly lock.
3. Tape down lock bar over the panel to hold in position.

Reverse the procedure above to remove the connector:

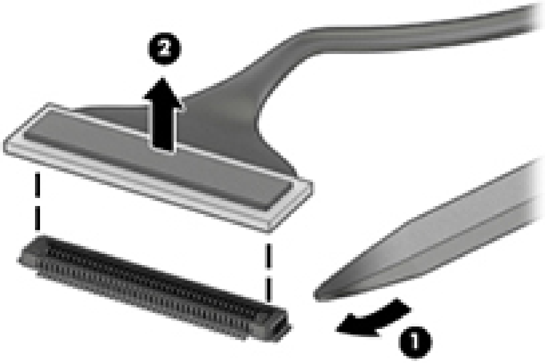
1. Remove tape.
2. Pull up bar (pull tape) and release the lock with the PCB connector.
3. Pull to the direction in parallel with PCB to withdraw the connector.





Multi-pin vertical insert connector (LVDS cable to system board)

- Remove the connector gasket prior to removing the connector.
- If the connector has a plastic pull tab, use the tab to disconnect. Otherwise, use flat tool under the connector to remove evenly. Do not pull on the cable to remove.
- Press evenly when reseating/reconnecting/installing the connector.



For more information about cable management, see Cable management on page 132.

7 Tablet Setup (BIOS), TPM, and HP Sure Start

Using Tablet Setup

Tablet Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Tablet Setup includes settings for the types of devices installed, the startup sequence of the tablet, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Tablet Setup. Errors can prevent the tablet from operating properly.

Starting Tablet Setup

▲ Turn off the tablet. Press the power button, quickly press and hold the volume down button until the Startup menu is displayed, and then tap **F10** to enter the **BIOS Setup** menu.

Navigating and selecting in Tablet Setup

- To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to select the item.
- To scroll up and down, select the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.
- To close open dialog boxes and return to the main Tablet Setup screen, press esc, and then follow the on-screen instructions.

To exit Tablet Setup menus, choose one of the following methods:

- To exit Tablet Setup menus without saving your changes:

  Select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Ignore Changes and Exit**, and then press enter.

- To save your changes and exit Tablet Setup menus:

  Select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the tablet restarts.

Restoring factory settings in Tablet Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Tablet Setup to the values that were set at the factory, follow these steps:

1. Start Tablet Setup. See Starting Tablet Setup on page 135.
2. Select **Main**, and then select **Apply Factory Defaults and Exit**.

   NOTE: On select products, the selections may display **Restore Defaults** instead of **Apply Factory Defaults and Exit**.
3. Follow the on-screen instructions.
4. To save your changes and exit, select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the tablet restarts.

NOTE: Your password settings and security settings are not changed when you restore the factory settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP website.

Most BIOS updates on the HP website are packaged in compressed files called *SoftPaqs*.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS version

To decide whether you need to update Tablet Setup (BIOS), first determine the BIOS version on your tablet.

BIOS version information (also known as *ROM date* and *System BIOS*) can be accessed by pressing fn+esc (if you are already in Windows), by pressing **Start** > **Run** > `msinfo32`, or by using Tablet Setup.

1. Start Tablet Setup. See Starting Tablet Setup on page 135.
2. Select **Main**, and then select **System Information**.
3. To exit Tablet Setup without saving your changes, select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Ignore Changes and Exit**, and then press enter.

To check for later BIOS versions, see Downloading a BIOS update on page 137.

Downloading a BIOS update

⚠ CAUTION: To reduce the risk of damage to the tablet or an unsuccessful installation, download and install a BIOS update only when the tablet is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the tablet is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power on the tablet by unplugging the power cord from the AC outlet.

Do not shut down the tablet or initiate Sleep.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. Type `support` in the taskbar search box, and then select the HP Support Assistant app.

   – or –

   Select the question mark icon in the taskbar.
2. Select **Updates**, and then select **Check for updates and messages**.
3. Follow the on-screen instructions.
4. At the download area, follow these steps:
   - a. Identify the most recent BIOS update and compare it to the BIOS version currently installed on your tablet. Make a note of the date, name, or other identifier. You may need this information to locate the update later, after it has been downloaded to your hard drive.
   - b. Follow the on-screen instructions to download your selection to the hard drive.

     Make a note of the path to the location on your hard drive where the BIOS update is downloaded. You will need to access this path when you are ready to install the update.

   NOTE: If you connect your tablet to a network, consult the network administrator before installing any software updates, especially system BIOS updates.

BIOS installation procedures vary. Follow any instructions that are displayed on the screen after the download is complete. If no instructions are displayed, follow these steps:

1. Type `file` in the taskbar search box, and then select **File Explorer**.
2. Select your hard drive designation. The hard drive designation is typically Local Disk (C:).
3. Using the hard drive path you recorded earlier, open the folder that contains the update.
4. Double-click the file that has an .exe extension (for example, *filename*.exe).

   The BIOS installation begins.
5. Complete the installation by following the on-screen instructions.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Changing the boot order

To dynamically choose a boot device for the current startup sequence, follow these steps:

1. Turn off the tablet. Press the power button, quickly press and hold the volume down button until the Startup menu is displayed, and then tap **F9** to enter the **Boot** menu.
2. Select a boot device, press enter, and then follow the on-screen instructions.

TPM BIOS settings (select products only)

IMPORTANT: Before enabling Trusted Platform Module (TPM) functionality on this system, you must ensure that your intended use of TPM complies with relevant local laws, regulations and policies, and approvals or licenses must be obtained if applicable. For any compliance issues arising from your operation/usage of TPM which violates the above mentioned requirement, you shall bear all the liabilities wholly and solely. HP will not be responsible for any related liabilities.

TPM provides additional security for your tablet. You can modify the TPM settings in Tablet Setup (BIOS).

NOTE: If you change the TPM setting to Hidden, TPM is not visible in the operating system.

To access TPM settings in Tablet Setup:

1. Start Tablet Setup. See Starting Tablet Setup on page 135.
2. Select **Security**, select **TPM Embedded Security**, and then follow the on-screen instructions.

Using HP Sure Start (select products only)

Select tablet models are configured with HP Sure Start, a technology that monitors the tablet's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start automatically restores the BIOS to its previously safe state, without user intervention.

HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.

8 Using HP PC Hardware Diagnostics (UEFI)

HP PC Hardware Diagnostics is a Unified Extensible Firmware Interface (UEFI) that allows you to run diagnostic tests to determine whether the tablet hardware is functioning properly. The tool runs outside the operating system so that it can isolate hardware failures from issues that are caused by the operating system or other software components.

When HP PC Hardware Diagnostics UEFI detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. This ID code can then be provided to support to help determine how to correct the problem.

To start HP PC Hardware Diagnostics (UEFI), follow these steps:

1. Turn off the tablet. Press the power button, and then quickly press and hold the volume down button until the Startup menu is displayed.
2. Tap **F2**.

   The BIOS searches three places for the diagnostic tools, in the following order:

   a. Connected USB drive

      NOTE: To download the HP PC Hardware Diagnostics (UEFI) tool to a USB drive, see Downloading HP PC Hardware Diagnostics (UEFI) to a USB device on page 140.

   b. Hard drive

   c. BIOS
3. When the diagnostic tool opens, select the type of diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: To stop a test, press the button you used to access UEFI.

Downloading HP PC Hardware Diagnostics (UEFI) to a USB device

NOTE: The HP PC Hardware Diagnostics (UEFI) download instructions are provided in English only, and you must use a Windows tablet to download and create the HP UEFI support environment because only .exe files are offered.

There are two options to download HP PC Hardware Diagnostics to a USB device.

Download the latest UEFI version

1. Go to http://www.hp.com/go/techcenter/pcdiags. The HP PC Diagnostics home page is displayed.
2. In the HP PC Hardware Diagnostics section, select the **Download** link, and then select **Run**.

Download any version of UEFI for a specific product

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**.
3. Enter the product name or number.
4. Select your tablet, and then select your operating system.
5. In the **Diagnostic** section, follow the on-screen instructions to select and download the needed UEFI version.

9 Specifications

	Metric	U.S.
Tablet dimensions		
Width	36.5 cm	14.5 in
Depth	22.7 cm	8.9 in
Height	1.3 cm	0.5 in
Weight (includes UMA fan/heat sink assemby, two 4-GB memory modules, no webcam, HP Z Turbo Drive solid-state drive, and no fingerprint reader)	1.4 kg	3.1 lbs
Tablet and keyboard dimensions		
Width	36.5 cm	14.5 in
Depth	22.7 cm	8.9 in
Height	1.9 cm	0.7 in
Weight (includes UMA fan/heat sink assembly, two 4-GB memory modules, no webcam, HP Z Turbo Drive solid-state drive, no fingerprint reader, and soft keyboard)	1.9 kg	4.2 lbs
Temperature		
Operating	5°C to 35°C	41°F to 95°F
Nonoperating	-20°C to 60°C	-4°F to 140°F
Relative humidity (noncondensing)		
Operating	10% to 90%	
Nonoperating	5% to 95%	
Maximum altitude (unpressurized)		
Operating	-15 m to 3,048 m	-50 ft to 10,000 ft
Nonoperating	-15 m to 12,192 m	-50 ft to 40,000 ft

NOTE: Applicable product safety standards specify thermal limits for plastic surfaces. The device operates well within this range of temperatures.

10 Backing up, restoring, and recovering

This chapter provides information about the following processes. The information in the chapter is standard procedure for most products.

- Creating recovery media and backups
- Restoring and recovering your system

For additional information, refer to the HP Support Assistant app.

▲ Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

– or –

Select the question mark icon in the taskbar.

IMPORTANT: If you will be performing recovery procedures on a tablet, the tablet battery must be at least 70% charged before you start the recovery process.

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base before beginning any recovery process.

Creating recovery media and backups

The following methods of creating recovery media and backups are available on select products only. Choose the available method according to your computer model.

- Use HP Recovery Manager to create HP Recovery media after you successfully set up the computer. This step creates a backup of the HP Recovery partition on the computer. The backup can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced. For information on creating recovery media, see Creating HP Recovery media (select products only) on page 142. For information on the recovery options that are available using the recovery media, see Using Windows tools on page 143.
- Use Windows tools to create system restore points and create backups of personal information.

  For more information, see Recovering using HP Recovery Manager on page 144.

  NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

Creating HP Recovery media (select products only)

If possible, check for the presence of the Recovery partition and the Windows partition. From the **Start** menu, select **File Explorer**, and then select **This PC**.

- If your computer does not list the Windows partition and the Recovery partition, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

You can use Windows tools to create system restore points and create backups of personal information, see Using Windows tools on page 143.

- If your computer does list the Recovery partition and the Windows partition, you can use HP Recovery Manager to create recovery media after you successfully set up the computer. HP Recovery media can be used to perform system recovery if the hard drive becomes corrupted. System recovery reinstalls the original operating system and software programs that were installed at the factory and then configures the settings for the programs. HP Recovery media can also be used to customize the system or restore the factory image if you replace the hard drive.
  - Only one set of recovery media can be created. Handle these recovery tools carefully, and keep them in a safe place.
  - HP Recovery Manager examines the computer and determines the required storage capacity for the media that will be required.
  - To create recovery discs, your computer must have an optical drive with DVD writer capability, and you must use only high-quality blank DVD-R, DVD+R, DVD-R DL, or DVD+R DL discs. Do not use rewritable discs such as CD±RW, DVD±RW, double-layer DVD±RW, or BD-RE (rewritable Blu-ray) discs; they are not compatible with HP Recovery Manager software. Or, instead, you can use a high-quality blank USB flash drive.
  - If your computer does not include an integrated optical drive with DVD writer capability, but you would like to create DVD recovery media, you can use an external optical drive (purchased separately) to create recovery discs. If you use an external optical drive, it must be connected directly to a USB port on the computer; the drive cannot be connected to a USB port on an external device, such as a USB hub. If you cannot create DVD media yourself, you can obtain recovery discs for your computer from HP. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.
  - Be sure that the computer is connected to AC power before you begin creating the recovery media.
  - The creation process can take an hour or more. Do not interrupt the creation process.
  - If necessary, you can exit the program before you have finished creating all of the recovery DVDs. HP Recovery Manager will finish burning the current DVD. The next time you start HP Recovery Manager, you will be prompted to continue.

To create HP Recovery media:

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base before beginning these steps.

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Create recovery media**, and then follow the on-screen instructions.

If you ever need to recover the system, see Recovering using HP Recovery Manager on page 144.

Using Windows tools

You can create recovery media, system restore points, and backups of personal information using Windows tools.

NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

For more information and steps, see the Get started app.

▲ Select the **Start** button, and then select the **Get started** app.

Restore and recovery

There are several options for recovering your system. Choose the method that best matches your situation and level of expertise:

IMPORTANT: Not all methods are available on all products.

- Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state. For more information see the Get started app.

  ▲ Select the **Start** button, and then select the **Get started** app.

- If you need to correct a problem with a preinstalled application or driver, use the Reinstall drivers and/or applications option (select products only) of HP Recovery Manager to reinstall the individual application or driver.

  ▲ Type `recovery` in the taskbar search box, select **HP Recovery Manager**, select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.

- If you want to recover the Windows partition to original factory content, you can choose the System Recovery option from the HP Recovery partition (select products only) or use the HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 144. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 142.
- On select products, if you want to recover the computer's original factory partition and content, or if you have replaced the hard drive, you can use the Factory Reset option of HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 144.
- On select products, if you want to remove the Recovery partition to reclaim hard drive space, HP Recovery Manager offers the Remove Recovery Partition option.

  For more information, see Removing the HP Recovery partition (select products only) on page 147.

Recovering using HP Recovery Manager

HP Recovery Manager software allows you to recover the computer to its original factory state by using the HP Recovery media that you either created or that you obtained from HP, or by using the HP Recovery partition (select products only). If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 142.

What you need to know before you get started

- HP Recovery Manager recovers only software that was installed at the factory. For software not provided with this computer, you must either download the software from the manufacturer's website or reinstall the software from the media provided by the manufacturer.

  IMPORTANT: Recovery through HP Recovery Manager should be used as a final attempt to correct computer issues.

- HP Recovery media must be used if the computer hard drive fails. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 142.
- To use the Factory Reset option (select products only), you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 142.
- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information from the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data you want to retain.

Using HP Recovery media, you can choose from one of the following recovery options:

NOTE: Only the options available for your computer display when you start the recovery process.

- System Recovery—Reinstalls the original operating system, and then configures the settings for the programs that were installed at the factory.
- Factory Reset—Restores the computer to its original factory state by deleting all information from the hard drive and re-creating the partitions. Then it reinstalls the operating system and the software that was installed at the factory.

The HP Recovery partition (select products only) allows System Recovery only.

Using the HP Recovery partition (select products only)

The HP Recovery partition allows you to perform a system recovery without the need for recovery discs or a recovery USB flash drive. This type of recovery can be used only if the hard drive is still working.

To start HP Recovery Manager from the HP Recovery partition:

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base before beginning these steps (select products only).

1. Type `recovery` in the taskbar search box, select **Recovery Manager**, and then select **HP Recovery Environment**.

   – or –

   For computers or tablets with keyboards attached, press f11 while the computer boots, or press and hold f11 as you press the power button.

   For tablets without keyboards:

   - Turn on or restart the tablet, and then quickly hold down the volume up button; then select **f11**.

   – or –

   - Turn on or restart the tablet, and then quickly hold down the volume down button; then select **f11**.
2. Select **Troubleshoot** from the boot options menu.
3. Select **Recovery Manager**, and then follow the on-screen instructions.

Using HP Recovery media to recover

You can use HP Recovery media to recover the original system. This method can be used if your system does not have an HP Recovery partition or if the hard drive is not working properly.

1. If possible, back up all personal files.
2. Insert the HP Recovery media, and then restart the computer.

   NOTE: If the computer does not automatically restart in HP Recovery Manager, change the computer boot order. See Changing the computer boot order on page 146.
3. Follow the on-screen instructions.

Changing the computer boot order

If your computer does not restart in HP Recovery Manager, you can change the computer boot order, which is the order of devices listed in BIOS where the computer looks for startup information. You can change the selection to an optical drive or a USB flash drive.

To change the boot order:

IMPORTANT: For a tablet with a detachable keyboard, connect the tablet to the keyboard base before beginning these steps.

---

1. Insert the HP Recovery media.
2. Access the system **Startup** menu.

   For computers or tablets with keyboards attached:

   ▲ Turn on or restart the computer or tablet, quickly press esc, and then press f9 for boot options.

   For tablets without keyboards:

   ▲ Turn on or restart the tablet, and then quickly hold down the volume up button; then select **f9**.

   – or –

   Turn on or restart the tablet, and then quickly hold down the volume down button; then select **f9**.
3. Select the optical drive or USB flash drive from which you want to boot.
4. Follow the on-screen instructions.

Removing the HP Recovery partition (select products only)

HP Recovery Manager software allows you to remove the HP Recovery partition to free up hard drive space.

IMPORTANT: After you remove the HP Recovery partition, you will not be able to perform System Recovery or create HP Recovery media from the HP Recovery partition. So before you remove the Recovery partition, create HP Recovery media; see Creating HP Recovery media (select products only) on page 142.

NOTE: The Remove Recovery Partition option is only available on products that support this function.

Follow these steps to remove the HP Recovery partition:

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Remove Recovery Partition**, and then follow the on-screen instructions.

11 Statement of memory volatility

The purpose of this chapter is to provide general information regarding nonvolatile memory in HP Business PCs. This chapter also provides general instructions for restoring nonvolatile memory that can contain personal data after the system has been powered off and the hard drive has been removed.

HP Business PC products that use Intel®-based or AMD®-based system boards contain volatile DDR memory. The amount of nonvolatile memory present in the system depends upon the system configuration. Intel-based and AMD-based system boards contain nonvolatile memory subcomponents as originally shipped from HP, assuming that no subsequent modifications have been made to the system and assuming that no applications, features, or functionality have been added to or installed on the system.

Following system shutdown and removal of all power sources from an HP Business PC system, personal data can remain on volatile system memory (DIMMs) for a finite period of time and will also remain in nonvolatile memory. Use the steps below to remove personal data from the PC, including the nonvolatile memory found in Intel-based and AMD-based system boards.

Current BIOS steps

1. Follow steps (a) through (l) below to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.

    a. Turn on or restart the tablet, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

    NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

    b. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes** to load defaults.

    The tablet will reboot.

    c. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

    NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

    d. Select the **Security** menu, select **Restore Security Settings to Factory Defaults**, and then select **Yes** to restore security level defaults.

    The tablet will reboot.

    e. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

    NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

    f. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

    g. If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Utilities** under the **Utilities** menu. Select **Hard Drive Utilities**, select **DriveLock**, then uncheck the checkbox for **DriveLock** password on restart. Select **OK** to proceed.

h. Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message.

   The tablet will reboot.

i. During the reboot, press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

j. Select the **Main** menu, select **Apply Factory Defaults and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

k. Reboot the system. If the system has a Trusted Platform Module (TPM) and/or fingerprint reader, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor; press or tap F1 to accept or F2 to reject.

l. Remove all power and system batteries for at least 24 hours.

2. Complete one of the following:

   - Remove and retain the storage drive.

     – or –

   - Clear the drive contents by using a third party utility designed to erase data from a solid-state drive.

     – or –

   - Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

     IMPORTANT: If you clear data using Secure Erase, it cannot be recovered.

   a. Turn on or restart the tablet, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   b. Select the **Security** menu and scroll down to the **Utilities** menu.

   c. Select **Hard Drive Utilities**.

   d. Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

Nonvolatile memory usage

Nonvolatile memory type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
HP Sure Start flash (select models only)	8 MBytes	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical PC configuration data for select platforms that support HP Sure Start. For more information, see [Using HP Sure Start (select models only) on page 153](#).	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 Bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using the Tablet Setup (BIOS), or changing the Microsoft Windows date and time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KBytes (not customer accessible)	No	Yes	Stores NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility is required to write data to this memory and is available from the NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 Bytes per memory board, 128 Bytes programmable (not customer accessible)	No	Yes	Stores memory board information.	DIMM SPD is programmed by the memory vendor.	Data cannot be written to this memory when the board is installed in a PC. The specific write-protection method varies by memory vendor.
System BIOS	9 MBytes	Yes	Yes	Stores system BIOS code and PC configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are input using the Tablet Setup (BIOS) or a custom utility.	**NOTE:** Writing data to this ROM in an inappropriate manner can render the PC non-functional. A utility is required for writing data to this memory and is available on the HP website; go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then

Nonvolatile memory type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
						follow the on-screen instructions.
Intel Management Engine Firmware (present in only specific ZBook and EliteBook models. For more information, go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then follow the on-screen instructions.)	1.5 MBytes or 7 MBytes	Yes	Yes	Stores Management Engine Code, Settings, Provisioning Data and iAMT third-party data store.	Management Engine Code is programmed at the factory. Code is updated via Intel secure firmware update utility. Unique Provisioning Data can be entered at the factory or by an administrator using the Management Engine (MEBx) setup utility. The third-party data store contents can be populated by a remote management console or local applications that have been registered by an administrator to have access to the space.	The Intel chipset is configured to enforce hardware protection to block all direct read/write access to this area. An Intel utility is required for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.
Bluetooth flash (select products only)	2 Mbit	No	Yes	Stores Bluetooth configuration and firmware.	Bluetooth flash is programmed at the factory. Tools for writing data to this memory are not publicly available but can be obtained from the silicon vendor.	A utility is required for writing data to this memory and is made available through newer versions of the driver whenever the flash requires an upgrade.
802.11 WLAN EEPROM	4 Kbit to 8 Kbit	No	Yes	Stores configuration and calibration data.	802.11 WLAN EEPROM is programmed at the factory. Tools for writing data to this memory are not made public.	A utility is required for writing data to this memory and is usually not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Webcam (select products only)	64 Kbit	No	Yes	Stores webcam configuration and firmware.	Webcam memory is programmed using a utility from the device manufacturer that can be run from Windows.	A utility is required for writing data to this memory and is usually not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Fingerprint reader (select products only)	512 KByte flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	Only a digitally signed application can make the call to write to the flash.

Questions and answers

1. How can the BIOS settings be restored (returned to factory settings)?

   IMPORTANT: Restore defaults does not securely erase any data on your hard drive. See question and answer 6 for steps to securely erase data.

   Restore defaults does not reset the Custom Secure Boot keys. See question and answer 7 for information about resetting the keys.

   a. Turn on or restart the tablet, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   b. Select **Main**, and then select **Restore defaults**.

   c. Follow the on-screen instructions.

   d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

2. What is a UEFI BIOS, and how is it different from a legacy BIOS?

   The Unified Extensible Firmware Interface (UEFI) BIOS is an industry-standard software interface between the platform firmware and an operating system (OS). It is a replacement for the older BIOS architecture, but supports much of the legacy BIOS functionality.

   Like the legacy BIOS, the UEFI BIOS provides an interface to display the system information and configuration settings and to change the configuration of your tablet before an OS is loaded. BIOS provides a secure run-time environment that supports a Graphic User Interface (GUI). In this environment, you can use either a pointing device (Touchscreen, TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make menu and configuration selections. The UEFI BIOS also contains basic system diagnostics.

   The UEFI BIOS provides functionality beyond that of the legacy BIOS. In addition, the UEFI BIOS works to initialize the tablet’s hardware before loading and executing the OS; the run-time environment allows the loading and execution of software programs from storage devices to provide more functionality, such as advanced hardware diagnostics (with the ability to display more detailed system information) and advanced firmware management and recovery software.

   HP has provided options in Tablet Setup (BIOS) to allow you to run in legacy BIOS, if required by the operating system. Examples of this requirement would be if you upgrade or downgrade the OS.

3. Where does the UEFI BIOS reside?

   The UEFI BIOS resides on a flash memory chip. A utility is required to write to the chip.

4. What kind of configuration data is stored on the DIMM Serial Presence Detect (SPD) memory board? How would this data be written?

   The DIMM SPD memory contains information about the memory board, such as size, serial number, data width, speed/timing, voltage, and thermal information. This information is written by the board manufacturer and stored on an EEPROM. This EEPROM cannot be written to when the memory board is installed in a PC. Third-party tools do exist that can write to the EEPROM when the memory board is not installed in a PC. Various third-party tools are available to read SPD memory.

5. What is meant by “Restore the nonvolatile memory found in Intel-based system boards”?

   This message relates to clearing the Real Time Clock (RTC) CMOS memory that contains PC configuration data.

6. How can the BIOS security be reset to factory defaults and data erased?

IMPORTANT: Resetting will result in the loss of information.

These steps will not reset Custom Secure Boot Keys. See question and answer 7 for information about resetting the keys.

a. Turn on or restart the tablet, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select **Main**, and then select **Reset BIOS Security to Factory Default**.

c. Follow the on-screen instructions.

d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

7. How can the Custom Secure Boot Keys be reset?

   Secure Boot is a feature to ensure that only authenticated code can start on a platform. If you enabled Secure Boot and created Custom Secure Boot Keys, simply disabling Secure Boot will not clear the keys. You must also select to clear the Custom Secure Boot Keys. Use the same Secure Boot access procedure you used to create the Custom Secure Boot Keys, but make the selection to clear or delete all Secure Boot Keys.

   a. Turn on or restart the tablet, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.

   c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select models only)

Select tablet models are configured with HP Sure Start, a technology that continuously monitors your tablet's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start restores the BIOS to its previously safe state, without user intervention. Those select tablet models ship with HP Sure Start configured and enabled. HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then follow the on-screen instructions.

12 Power cord set requirements

The wide-range input feature of the tablet permits it to operate from any line voltage from 100 to 120 volts AC, or from 220 to 240 volts AC.

The 3-conductor power cord set included with the tablet meets the requirements for use in the country or region where the equipment is purchased.

Power cord sets for use in other countries and regions must meet the requirements of the country or region where the tablet is used.

Requirements for all countries

The following requirements are applicable to all countries and regions:

- The length of the power cord set must be at least 1.0 m (3.3 ft) and no more than 2.0 m (6.5 ft).
- All power cord sets must be approved by an acceptable accredited agency responsible for evaluation in the country or region where the power cord set will be used.
- The power cord sets must have a minimum current capacity of 10 amps and a nominal voltage rating of 125 or 250 V AC, as required by the power system of each country or region.
- The appliance coupler must meet the mechanical configuration of an EN 60 320/IEC 320 Standard Sheet C13 connector for mating with the appliance inlet on the back of the tablet. Requirements for all countries 113

Requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Australia	EANSW	1
Austria	OVE	1
Belgium	CEBC	1
Canada	CSA	2
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1
Italy	IMQ	1
Japan	METI	3
The Netherlands	KEMA	1
Norway	NEMKO	1
The People's Republic of China	COC	5

Country/region	Accredited agency	Applicable note number
South Korea	EK	4
Sweden	CEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	4
The United Kingdom	BSI	1
The United States	UL	2

1. The flexible cord must be Type HO5VV-F, 3-conductor, 1.0-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
2. The flexible cord must be Type SPT-3 or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
3. The appliance coupler, flexible cord, and wall plug must bear a “T” mark and registration number in accordance with the Japanese Dentori Law. The flexible cord must be Type VCT or VCTF, 3-conductor, 1.00-mm² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V) configuration.
4. The flexible cord must be Type RVV, 3-conductor, 0.75-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
5. The flexible cord must be Type VCTF, 3-conductor, 0.75-mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.

13 Recycling

When a non-rechargeable or rechargeable battery has reached the end of its useful life, do not dispose of the battery in general household waste. Follow the local laws and regulations in your area for battery disposal.

HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, see the HP Web site at http://www.hp.com/recycle.

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